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A
D I S S E R T A T I O N
O N T H E
Antiquity of the Earth,

READ AT THE ROYAL SOCIETY, 12th MAY, 1785.

Το ἀληθὲς μόνον δύναται τὰς ἀνθρώπους ποιεῖν θεοπαρεπληστίας

PORPHYRY.

By the Rev. JAMES DOUGLAS, F. A. S.



L O N D O N:
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P R E F A C E.

METAPHYSICAL truths can only be established, by producing effects from corresponding causes ; and though we may confront such demonstrative evidence with the immutable laws of mathematical decision, we must be sensible that there will still remain some pretence
for

for doubt ; thus the basis of that knowledge, which on these principles we have been long labouring to accomplish, will become an endless toil, an endless source for controversy : and having the passions and the prejudices of mankind to combat, which mathematical certainty can alone effectually suppress, we must content ourselves only with making converts of those who have minds sufficiently expansive to listen to hypothetical arguments, without the shackles of Euclid, and the vanity of displaying their own learning and pedantry.

MUCH

MUCH may be said in favour of that restriction, which the human mind would be subject to, when on the flight of imagination it may be induced to soar to the dangerous regions of conjecture; but were we only to admit mathematical argument into our inquiries, men would be restrained from their ardour of conception, and becoming languid in their pursuits after knowledge, they would sink into a lasting supineness: yet after all our tedious researches, miserably incapacitated as we are, we must be satisfied with a limited approach to first causes, and at a respectable distance, contemplate with a

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pious wonder, the inscrutable works of the Almighty.

THE following Dissertation has been framed from a multiplicity of authentic materials which relate to the natural Theory of the Earth, and much serious inquiry into the writings of learned men, who have been diffuse on the subject. Polemical references only confuse and disgust the reader of taste and discernment, I have therefore concentrated a few select facts into a small compass.

THE Smaragdine tables of Hermes Tref-
megistus,

megistus, who is said to have flourished in the time of Joshua, would have little weight in a plain relation of discoveries in the fossil kingdom ; and as the ΠΡΟΤΟΝ ΔΕΚΤΙΚΟΝ or first cause of solidity, is not yet explained by any of our learned chymists, I have therefore only presumed to draw my conclusions from the most obvious effects, and which should be presented to the human mind with as much clearness and energy as the writer is master of.

J. DOUGLAS.

THE HISTORY OF THE

REIGN OF CHARLES THE FIRST

BY JOHN BURNET

IN TWO VOLUMES

LONDON: Printed by J. Sturges, at the

Sign of the Anchor, in St. Dunstons Church-yard,

near St. Dunstons Church, in the City of London,

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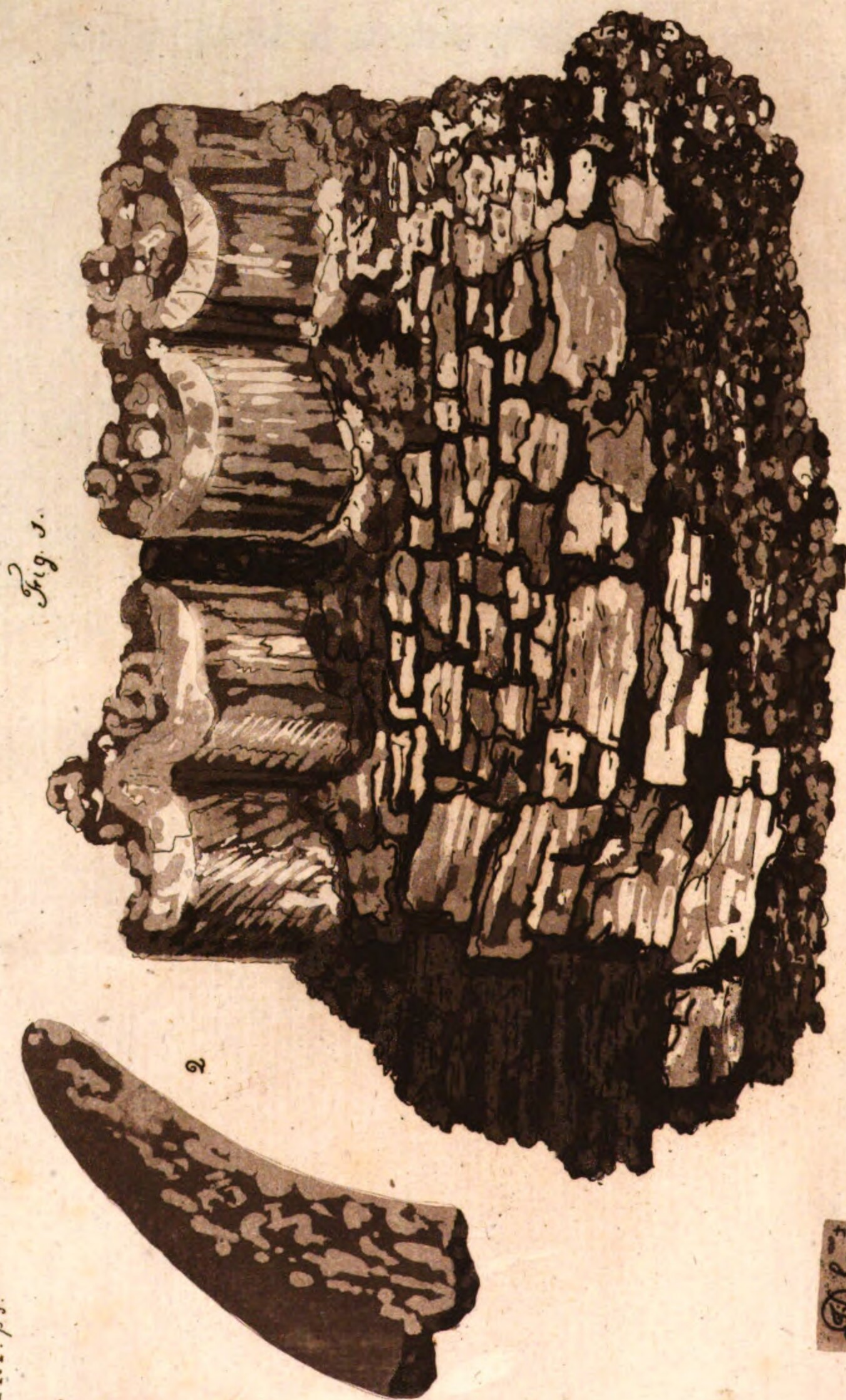
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A
D I S S E R T A T I O N
ON THE
ANTIQUITY OF THE EARTH.

MANY extravagant notions having been lately propagated on the subject of animal and testaceous petrifications, I have presumed to transmit to this learned Society some important facts, which may possibly admit of *data* for a more comprehensive inquiry into these phenomena.

B

ON

ON the 18th of June, 1773, an excavation was made in the yard of Mr. James Best, of Chatham, for the foundation of a store-house. The labourers, at the depth of twelve feet, discovered the bones of a very large animal. They were deposited in a stratum of drift or river sand, blended with a kind of clay, of a yellowish grey tinge. The superior soil, within a few lines of the stratum which covered the bones, was a compact and native brick loam, with horizontal veins of a blackish hue running through it. This vein of loam extends in an horizontal direction through the town of Chatham, about twenty feet above the level of the river Medway at high water-mark, and about one hundred yards from the strand at the same level.

By the position of the bones, and the fragments that were reserved, they appear to have belonged to one entire animal. Those which I procured consisted of an under jaw, with two of the *molars*, two inches broad, a curvated tooth, the drawing here subjoined being a fac simile of both, LATE I. vide FIG. 1 and FIG. 2, and which in the year 1781 I presented to the museum of Sir Ashton Lever.

Lever. I also preserved the fragments of the blade-bone, which bone was two feet long, ten inches wide at the broad end, and four inches at the smallest; these, with several fragments of tusks and bones, I have here submitted to the inspection of the Society. The remaining bones of the animal were carted to a small distance from Mr. Best's yard, and scattered with the soil over a pasture ground, excepting some few specimens which Mr. Best gave orders to be saved, and which have since been mislaid: from the minutes, which are in my possession, taken on the spot by the Reverend T. Austin of St. Margaret's, near Rochester, and late minor Canon of that cathedral, they appear to have consisted of several ends of joint bones, parts of the shank bones, some a foot and upwards in length; a large rib, three inches broad, and the small end towards the point, of a rayed or coarse yellowish tusk, about three inches in circumference, with several of the vertebræ

THE bones are deprived of their ANIMAL SALT*,
and

* THE expression of animal salt was here proposed as a general term for animal matter in the sense of our old writers, the *proxima*

and some, especially the jaw, are permeated with a lapidescent matter. As their size greatly exceeded those of our common domestic animals, particularly the teeth, they were ignorantly reported to be

ma materia et συγαλταίου Soliditatis of all bodies, whether animal, marine, vegetable, or fossil. As I have had reasons for changing the expression, I thought proper to show cause why it was so used; and especially to prefix a note on the subject, as the expression was altered since the paper had been publicly read at the Royal Society.

ANIMAL SALT may very properly be admitted as a *το συγαλταίου* i. e. a concomitant cause of solidity, with their other principles of sulphur, and spirit or mercury among the older chymists, before Boyle and Homberg's time: the three together being always in their opinion necessarily co-existent under the several appropriated peculiarities of respective proportion and modification; as hypostatic principles of each sort of substance, on this globe at least; whether animal, vegetable, or *fossil*: which they termed their *tria prima*, and seemed to think that it was the peculiar—spirit—mercury,—or special modification of this, that gave the specific character to the other two principles, requisite also for the distinct constitution of each kind of substance, which derives its specific qualities from such combination, as they fancied, of these primary principles. Salt indeed appears to have been in their ideas the principle which chiefly afforded consistence and a bond of union to the others. The animal Salt—Sulphur—Spirit,—were each of them of a peculiar kind only specific to that order of substances: the vegetable the same; and the fossil the same;

be of an elephant, and ascribed to one of those which writers without reason supposed to have been transported into this country by the Emperor Claudius.

same; and by some were believed to be so originally and essentially, constituted or formed at the creation of the world.

A MORE modern set of chemists, after Homberg's time, added to the other three above mentioned, Earth and Water. The former of these two they distinguish from Salts, by its not being dissolvable in water, and insipid; the opposite of both of which qualities all salts have: and though they, and likewise a still more modern set of systematists in chemistry, do not deny the solidity of saline substances, and that they very often and remarkably add to the consistency, solidity and firmness of other bodies; yet they consider simple earth as more peculiarly the solid matter of our mundane system; being more permanent, and unsusceptible of change than salts, or any other bodies we have access to; whether however the earthy matter might not be made, by certain operations, to assume the characters of salts, and these, as well as it, be converted into others, or any of the other, now received principles of bodies among the more modern chemists, is a subject no way clearly ascertained; but may very properly admit of inquiry.

It should therefore seem, that the *proxima materia* of bodies, must be that combination of principles, which immediately constitutes their peculiar solid structure, and not any separate ingredient of the composition, or principle distinct from the rest; however important beyond the others it may seem for the general effect: hence it must be necessarily admitted that the ancient

Claudius. The human mind, on these occasions, being but too often tempted to yield to the marvellous, the *molaes* in question were by many learned

chemists assigned to SALTS a pre-eminence, in affording the uniting power, which gives consistence to the mass arising from the occasional specific junction of the three principles; each of which however was by them supposed to modify the other two, and to be modified by them mutually, as the specific nature of the body, they thus immediately constitute, requires: so that on all occasions they imagined them to be of, and mutually to communicate to each other, a modification of existence, peculiar to that species of bodies they on every occasion constitute, whether in the Heaven or the Earth, in animal, vegetable, or fossil substances; doubtless a strange jumble of things!

THE primary elements of all bodies, according to the most ancient philosophers and chemists, were four, Fire, Air, Water, and Earth. The chemical principles were Salt, Sulphur, and Mercury; before the end of the last century, Earth and Water were added. But, since the middle of this century, the chemists have mostly dropped the idea of elementary principles of bodies being within our reach of discovery; and have adopted an enumeration of the most simple parts we can perceive bodies to be resolvable into: which at present seem agreed among them to be Phlogiston, which answers to sulphur or the inflammable principle of the ancients, Air, Water, Saline bodies, Metallic bodies, and Earth: without pretending to assert that any one of them is an absolutely simple and uncompounded body,

learned men, considered as similar to those which are recorded in the Philosophical Transactions, No. 403, by Sir Hans Sloane ; whereas their form and size show them to be in every respect dissimilar. An elephant has only one grinder on each side ; this animal has three ; and their structure so very different, these being of a graminivorous and carnivorous kind, and in comparison so much smaller, that all analogy whatever must be out of the question. Judging therefore of the difference in the structure and size of the teeth of an animal that is both graminivorous and carnivorous, and of the proportion of the other bones, I did not hesitate to decide on these animal remains to

dy, or that some of them may not be the result of only variously modified combinations of other bodies ; perhaps of these same, or other yet undescribed classes of bodies.

THESE thoughts, as they started, have been thrown together not for the purpose of giving information, but to give a distinction between the terms applied by the ancients and moderns to the essential and component parts of bodies, as far as their ideas seem to have led them to interpret what might be said upon those subjects, and which I think necessary to subjoin in this place, to assign a reason why I adopted the word Animal Salt, as a general term against which some of our modern chemists have militated.

have

have belonged to the Hippopotamus ; but to be more accurate, and to remove all doubt as to the authenticity of a discovery of this consequence in our island, I compared the fossil *molars* with those of the recent ones in the jaw of the above animal in the Museum at Leicester House ; the confirmation was manifest : there was very little difference in the size, and no difference in the structure ; excepting that the fossil seemed to have belonged to an older animal, which in mastication had worn the teeth flat, or rather obliquely on their interior side towards the mouth. The Hippopotamus has two small curvated teeth between the two projecting lower tusks ; and on

PLATE I. comparing of FIG. II. which is the boney part that enters the ivory, it will be found perfectly similar to the recent tooth of the said animal. I shall now beg leave to wave all further detail as to the typical marks of these bones, and permit them to assert their identity with those gentlemen, who are skilled in the science of comparative anatomy : if therefore the following conclusions from this discovery may in the smallest degree tend to explain the cause of these phenomena found in the bowels of the earth, or to establish any principles for the advancement

advancement of the science of Cosmography, the time which I have employed in many practical researches of this nature, will I trust be of some service, and I hope justify me in a further prosecution of this study.

THESE hippopotamic remains being discovered petrified and entire, in a soil which had been formed by the residue of the waters, it should seem that they must have been deposited by this cause. The account of the deluge in holy writ might incline the learned to suppose that this animal had been floated from those regions, which in respect to climate, were congenial to its existence, and to have been left on the spot where it was found in its fossil state; but when we consider the great distance of the Medway from the Nile, or other rivers near the tropics, where these kinds of animals are now known to inhabit; and when we have no authority from the Pentateuch to conclude that any extraordinary convulsion in Nature had impelled animals at that period from their native regions to countries so remote, so we have no natural inference for concluding that the deluge was the cause of this phænomenon.

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HAD the deluge stranded animals under these circumstances, the superior parts of the chalky cliff where these fossil remains were found, would exhibit many palpable effects to have established this cause; with the retreat of the waters, animal as well as marine productions would have been also deposited; nor would the partial stratum of native loam extend itself to a certain altitude on the chalk; which, as being so evidently the effect of alluvion, the very summit of the neighbouring land would produce some marks of this nature; since we are instructed that the waters of the deluge covered the whole face of the earth: at all events therefore we must conclude, that these animal remains were deposited at an epoch separable from that of the deluge as recorded by Moses; but when evidence so powerfully militates against this instance, and that the stratum of the river soil is only discovered twenty feet above the level of the river at high water mark, and one hundred yards from the strand, on the same level in which the animal was found, it must consequently be admitted by rational deduction that these hippopotamic remains were placed in that stratum by the
the

river, which at some remote period had laved those heights ; and hence it will naturally follow, that as the Hippopotamus is known to be the inhabitant of muddy rivers, like those of the Nile and the Medway, it should therefore argue that this animal was the inhabitant of these regions, when in a state of climature to have admitted of its existence.

IF from the combination of these facts I should be permitted to argue with freedom, I have no doubt but much prejudice will be obliterated from the minds of many learned men, who, not having opportunities of making practical discoveries themselves, have been induced to adopt many systems of the natural theory of the earth, that have been founded on caprice, and some apparent truths but carelessly defined, and as carelessly established : it is therefore my intention to prove, from the critical observation made on the local discovery of these Hippopotamic remains,

That this island has been under a warmer influence of climature than at this present æra.

That

That the animal called the Hippopotamus, the inhabitant of the continent of Africa, must have been deposited on the strand of the river Medway by waters, separable from that epoch recorded in holy writ, which submerged the world in forty days.

That the earth was once endued with a power of transmuting bodies into stony or hard substances, which it seems no longer to possess ; or that by the undoubted testimony of these petrified animal bones, they must have been interred much anterior to any written record, from some extraordinary convulsion of the globe.*

* I beg to observe, when I speak of petrification, that I mean a quality which the earth appears to have had of indurating bodies, by the operation of certain acids, and not of that quality with which certain soils are endued, of depositing an earthy or ferruginous incrustation on the bodies enclosed in it : or of that power which produces sparry and stalactical matter, and which is sometimes found to enclose heterogenous bodies ; in short, of that power which is known to come within the scope of human definition, and to which a physical cause can be ascribed.

As

As it is necessary on abstruse disquisitions to state some relative principles, I shall here select three cases from a multiplicity of authentic and combined truths of the same nature, which I flatter myself will stand the test of the most scrupulous physical inquiry.

C A S E I.

From the specimens of fossil elephants tusks, which I have seen in the Emperor of Germany's Cabinet of Natural Curiosities at Vienna, and in other Museums, I observed that several were rendered throughout calcarious*, while others were entirely changed to the hardest black agate; the conclusion will therefore follow, that an immense length of time must have elapsed to have caused the absorption or decomposition of animal matter from the tusk, and to have rendered it sufficiently calcarious for the

* The property which the earth has had of rendering animal substances calcarious, seems to be entirely undefined by any of our learned physicians. That agent which has operated upon these substances must in its effects be similar to the operation of fire. It has by some chemists been attributed to acids.

E homogeneous

homogeneous substance with which it was saturated; for it is a known law in nature, that all bodies first become calcarious or friable before they enter into a lapidescent state. A reply may here be possibly made, that it requires but a few number of years to perform this operation; but this argument cannot subsist, when it is considered, that the power which so shortly produces this effect, will also decompose the more solid parts of the body; and I believe I may venture to propose, that no soil has ever produced bodies at any given time, so completely calcined, and in so compact a substance as the fossil elephants tusks which are discovered in the bowels of the earth over all Europe.

For the further illustration of this principle, I shall present the following *data*: gravelly and sandy soils, which often abound in the vitriolic acid, will in a short space of time entirely consume or decompose animal substances; whereas chalky or marly soils, not having the above quality in any like proportion, will preserve bones* when secure from the filtration of water,

* As many would wish in this disquisition to refer to the composition

ter, to any length of time, replete with their animal matter. Having had various opportunities of finding human bones in many different soils, with the date of their deposit interred near them,

component parts of bone, which might possibly be the means of causing fresh lights to be thrown on these fossil phenomena, I have here subjoined the remarks of a very skilful physician, Dr. Beugo, of Rochester, to whose friendship and acquaintance I am here happy to acknowledge much information and delight.

A FIBRE in physiology may be considered under the same relation to the other parts of the animal body, that in geometry a line is to other dimensions, i. e. length without breadth or thickness; and therefore cannot be supposed, under the idea of a simple fibre, to occupy any sensible latitude, or be divisible in its breadth or thickness. It cannot be supposed visible, even with the assistance of the highest magnifier; as we find that there are animals so minute that the nicest microscope cannot render them clearly discernible; while at the same time, the fibres that compose their slenderest parts must be inconceivably still more imperceptible; and may be supposed to be constituted of two or more elementary or earthy particles placed lengthways, without the intervention of any thing but that cement or gluten, which preserves their relative position with each other. All fibres of such magnitude as to be discernable to our senses, are evidently upon scrutiny divisible into finer and still finer really constituent fibres.

THE animal fibre is elastic, so as to fly back when bent or stretched,

them, and one in particular, which among a variety of relics found in a grave, produced two decisive *data*, I shall here take the liberty to introduce

stretched; to recover its former direction and degree of extent; yet, without the accession of nerves, the solid fibre is altogether insensible: and from what has been said it must appear, that the simple fibre is without blood, and can have no cavity in it, and that it is solid. The solid fibre is somewhat heavier than water, as will appear from observing, that all the solid parts of animals, before they have undergone putrefaction, sink in water. The animal fibre is also chiefly of a white colour; and, as a solid, discovers under the chemical analysis, that in its composition are contained Air, Water, Oil, Earth, and a small portion of Iron.

THE more firm and solid the constituent fibres of any part of an animal are, that part will yield the greater proportion of air, which is always elastic, when disengaged, though quiescent and apparently inelastic in its combined state. So great is the quantity of air that may be detached from the substance of bones, as to occupy a space 200 times the bulk of the bone it was disengaged from. Though the air, in its non-elastic state in hartshorn, did not occupy more than a seventh part of the whole bulk of the horn, it was found when restored to its elastic state, to occupy 234 times as much space as its respective portion of horn did.

THE quantity of water respectively contained in bones is not easily determined with precision; as it will readily appear, that its quantity will be less, proportionably to the hardness and solidity of the bone; I should guess however that it cannot exceed

duce them as perfectly essential to the matter of the present disquisition. Having therefore with the greatest circumspection, to guard against adventitious

a fourth part of the weight of the bones ; and the bulk of water will bear the proportion to the weight of the water, of that of a cubic inch for every 251, 42 grs. of water, contained in the bone ; and having previously ascertained the bulk of the whole original substance of the bone before its water was abstracted, the difference arising from the bulk of the water being subtracted from this, will give the bulk of the bone without that water, &c. taken from it.

By digestion in the vapour of water, by boiling it in water, but more perfectly, in Papin's digester, almost, if not entirely, the whole of a bone, but especially of a cartilage, may be reduced to a jelly ; or indeed the greater part of every bone seems to be jelly, or a gelatinous substance : for hartshorn will inspissate or make a jelly of sixteen times its own weight of water, and ivory fifteen times its weight. Two-thirds of the bones of a fetus are gluten : of an adult one-half, and of an old person a less proportion. In the early stages of the fetus, the solid parts are nothing but a gluten. The whole substance of a very young lamb, has, by a gentle heat been boiled to a mucilage.

WHEN the gluten of bones is extracted by the force of fire or of the air, they still retain their original form ; though they fall to dust at the slightest touch of the finger : and bones thus prepared are the fittest substances for many chemical instruments, particularly for the construction of vessels capable of sustaining

F

violent

ventitious circumstances from the upper coating of the earth, opened a barrow in a chalky soil, which contained human bones I found among many

violent heat without cracking. By restoring to bones their former gluten, they recover their original hardness, form, and structure : their consistence is likewise recovered, by drenching them with water or oil. Scraped bones, yield, by boiling in water, a gummy like jelly, a-kin to carpenter's glue, of which sort of substance the greatest quantity and strongest kind is procured from skins, tendons, and cartilages. On this gluey matter depends the elasticity of the animal fibre, and perhaps to a peculiar state of it, the peculiar irritability of some parts and constitutions, is due.

THE gluten of bones putrifies, and therefore becomes in greatest part volatile ; and by this process, or the force of fire, it may be so entirely dissipated as to leave in the bone nothing but a friable earthy substance, if not disturbed, retaining still its former extent and figure, and by the addition of oil, water or gluten, which it greedily drinks in, again recovers its hardness and consistence.

IN distillation, the animal gluten yields water, volatile salt, some marine salt, a fixed alkali, and a phosphoric oil (which last may chiefly be procured from bones,) and earth ; and this gluten is alike from whatever part of an animal it is extracted ; being always the same inodorous, insipid sort of substance, yielding as just now said, water, oil, salts, from the force of fire and earth. Though the oil seems in smallest proportion, it appears to have the

many rich ornaments of a female, the fragments of an ivory armilla and a coin of the Emperor Anthemius, who flourished A. D. 447.—

The

the greatest power, in affording tenacity and firmness to the bone. The proportion of the oil seems not yet estimated.

THOUGH the gluten contains oil, as a constituent of its composition; yet oily substances have no action on gelatinous matter, nor can rectified spirit of wine dissolve it. This spirit has no effect upon it when dry, and takes only part of the water from the gluten when liquid; and in so doing coagulating the jelly, may with much probability be attributed the thickening of the lymph, and the stuffing and bursting of the lymphatic vessels; from whence extravasation and dropsy ensue, and, in short, most of the distinguishing diseases, to which those accustomed to much use of spirituous liquors are subject.

THE Earth of Bones, as of all other parts of the animal body, is of the kind denominated calcarious, though it is not immediately calcinable into quick lime; but when it has been dissolved by the vitriolic acid, with which it forms a selenitic earth, and the acid is again separated from this selenite, by means of a fixed alkali, the precipitated earth will then be found calcinable into quick lime: but when the animal earth has undergone no farther alteration than what arises from the simple force of fire, in expelling all the volatile parts, it cannot be reduced, even by the most intense heat, to the state of calx or lime; but may in that condition, by very high degrees of heat be converted into a white opaque glass, arising from the phosphoric salt not yet entirely separated from it, being of a peculiarly
powerful

The bones which were entire, during the space of thirteen hundred years were not calcinated, but contained almost as much gluten or animal

powerful tendency to render earthy substances vitrescible, of all which the calcarious resist vitrification most obstinately.

UPON the total amount of observations made on solid animal matter, it appears that it requires for the separation of the other principles of its composition, from its simple earth, a very intense degree of fire, or, more effectually a very long exposure to the effects of the air: for though the bones of mummies, which have been preserved for more than a thousand years still retain the animal gluten, yet bones which have for many ages been exposed to the free action of air and passage of moisture, are so completely deprived of their oil and watery parts, as to be left in the simple state of friable earth, which when dry, though it preserves the original form, crumbles with the gentlest touch into powder, and incoherent particles not dissolvable in water.

IRON, or at least that kind of earth, which by combination with phlogiston produces iron, is to be found in every integrant part of an animal; but in least quantity in the bones, though in all in a very small proportion. It probably answers a variety of purposes in the animal œconomy; various according to the various fancies of physiologists: such as to give, as some conceive, a greater degree of firmness and solidity to the harder parts; according to others, to contribute to the colour and formation of the red globules of the blood, and their momentum, to assist towards the attrition of the blood and production of heat, and perhaps in the action of acids upon it in the state of calx in the fluids, throwing out heat and inflammable gas for various purposes in the system, and many other suppositions, too tedious now to mention or consider.

phlogiston



phlogiston as a recent bone ; and the ivory armilla, which was not a quarter of an inch in thickness, also preserved its animal salt *, vid. PLATE II, FIG. I. If therefore I have the most positive assurances from a simple chemical experiment, by passing through the fire, the calcarious substance of the fossil tooth of an elephant six inches in diameter, and a fragment of an ivory armilla only a quarter of an inch in thickness, that the latter yields animal matter, and the former not the smallest degree whatever of it ; must I not justly be permitted to draw this inference ; that as the earth, within the given time of *thirteen* hundred years has not had the power of petrifying so small a substance as an ivory armilla, or of extracting the animal property from it ; that the time which would have elapsed to have rendered the tusk of an elephant calcarious, and to have converted it into the solid substance of an agate, could not bear any relative proportion to the transition of time which human observation has thus prefixed : hence, by

* These remains I have likewise laid before the Society. They were found in a range of barrows of the lower Britons, opened under my inspection, and the contents in my possession; situated on Chatham Hill, within the King's works, Anno ; 1779.

a progressive succession of truths, I may naturally conclude, that some unknown lapse of time must have transpired for the production of this phenomenon, or that the earth must have been endued with a power of operating this effect, which some revolution in nature has now entirely destroyed.

As this exposition may meet with some trifling objection, not being able to ascertain with that precision as is necessary on discussions of this serious import to science, whether the chalky soil in which the elephant's tusks were found, was, in respect to its constituent quality, perfectly analagous to that which contained the ivory armilla, I shall therefore state Case the 2d. which will establish other *data* more satisfactory.

C A S E II.

IN the year 1771, at Kingston, on Burham Downs, the late Reverend Bryant Fawcett, of Heppington, near Canterbury, on opening a range of tumuli, discovered, among various relics of the fifth century,

H. III.

P. 23.

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Fig.

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J. D. f.

AQUA TINTA.

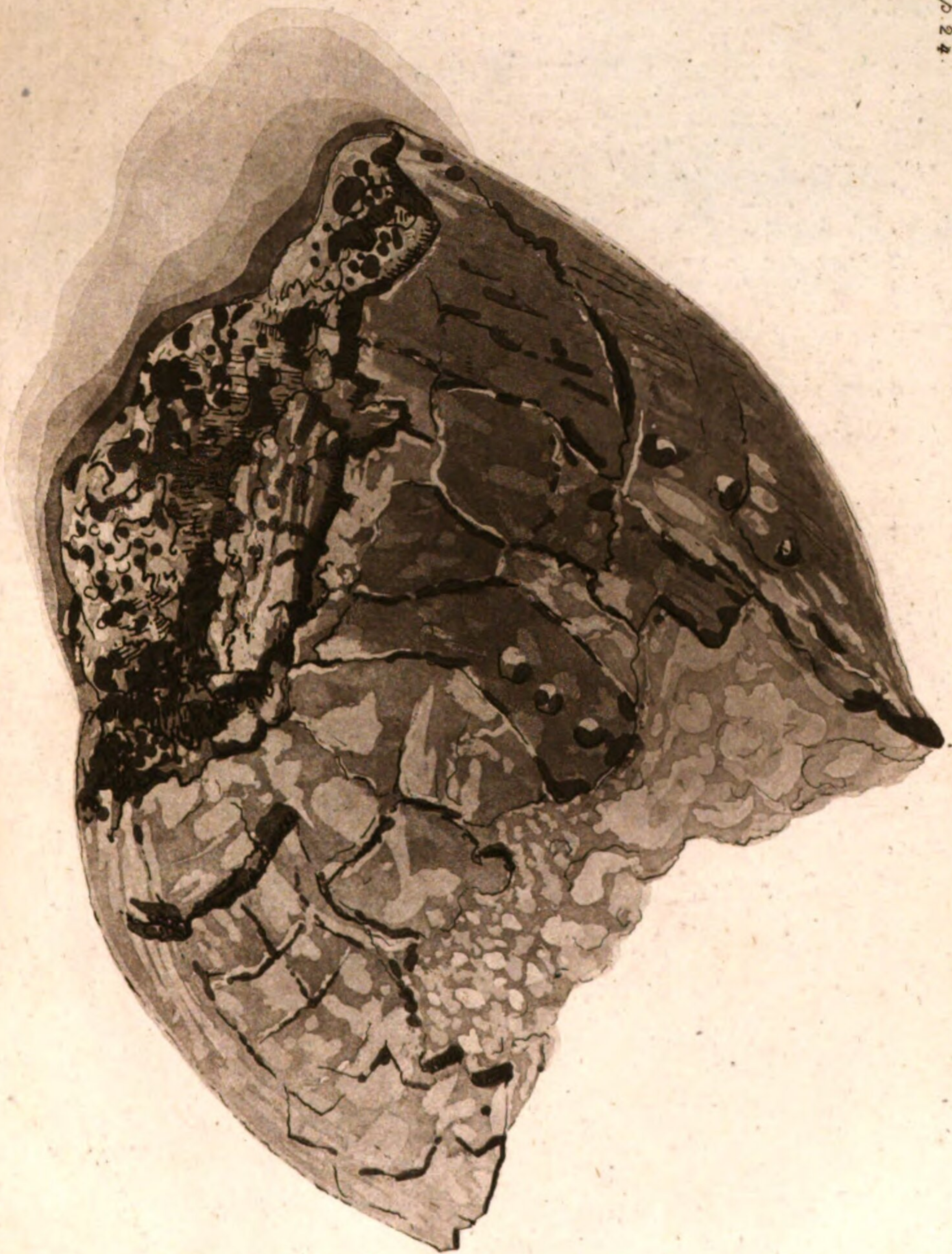
ry, a large East Indian Cowry (vid. PLATE II. PLATE II. FIG. III.) perforated, with a brass ring, which the pagan Romans used as a symbol of the *Deus regenerator*, and otherwise as an amulet of Priapus. Two coins were found in this barrow, vid. PLATE III. FIG. I, a Claudius of the 2d. brass, TI. CLAUDIUS CAESAR, AUG. PMTR. P. IMP. The reverse, *S. C. Pallas gradiens, dextrâ hastam, sinistra clypeum ferens.* FIG. II. a Carausius of the 3d size. IMP. CA-RAUSIUS. P. F. AUG. rev. PAX. AUG. *Fig. Mul. stans dextrâ ramum tenet. sinistra hastam.* The cowry, with three others found in barrows in this country, in the above learned antiquary's collection, was in part reduced to a calx, particularly the portion of it which laid nearest the body; but the far greater part preserved the substance of a recent shell, with its polish, and the discoloured spots which they are variously tinted with. Thus we have an instance of a shell that has remained near fourteen hundred years in the earth, without undergoing any very visible change of great decay, or indeed any change whatever to a state of petrefaction. If we therefore compare these

these effects with the chalk *echinus*, the *pectinite* and other marine remains found in the same *stratum* of chalk ; we shall then observe, by the induration of these shells, that they have undergone a palpable transmutation from their original state, and consequently, by a parity of argument, we have authority for concluding that an unknown lapse of time, bearing no proportion with the *data* expressed as above, must have passed, or some extraordinary event of matter must have taken place, to change these bodies from their original properties.

It would make an endless digression were I to state a variety of similar effects of marine and animal petrefactions found in the bowels of the earth ; the structure and matter of which, could not possibly come within the compass of human observation to fix on a period in which the transmutation has been performed ; I shall therefore briefly state .

C A S E

Pl. IV. p. 24.



Sec. in Aqua Sina.

C A S E III.

WHICH comprehends an argument founded on a fossil *tortoise*, vid. PLATE IV. and a PLATE IV. fossil *fruit*. The tortoise I have also exhibited for the inspection of the Society; the latter is in the possession of the learned President, Sir Joseph Banks. These fossils are considerably the largest of their kind that have been discovered in this island*. The *shell* of the tortoise measures six inches in breadth, and when entire, was near a foot in length; as the animal is observable in the shell by the thigh bone and other parts, it must have been too ponderous to have been floated on our coasts from the climes which are at this period congenial to its existence; consequently it should seem that it was the inhabitant of the coast where it was found in its fossil state.

* THESE fossils were found in the Isle of Sheppey; an island remarkable for a variety of animal, marine, and vegetable exotic petrefactions. The fossil fruit, one of the subjects of this inquiry, is a species of the almond, and is remarkable, in the opinion of the most intelligent persons, as bearing no analogy in size to any recent specimens of this nut discoverable in any quarter of the globe.

H

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THE fruit, which is the exact size of the drawing, vid. PLATE V. should also seem to have been the produce of these climes.

IF this fossil had been deposited by a reflux of the waters, it might possibly have been imbedded with the remains of animals, as is evident in the discovery of the tortoise, and a variety of other specimens of this nature, which could easily be enumerated; but it is not probable that fresh water, as well as salt water fish, would be found in the same stratum of soil; many specimens of which I have in my collection, particularly the head of a pike; the parts of this fish are too descriptive to admit of the smallest doubt of its identity: the under jaw of the pike is more elongated than the upper, and the latter totally deprived of any teeth. Specimens of salmon are frequently found in the same stratum, and various other palpable remains of the fresh water squamous tribe*.

THE time allotted in sacred writ for the retreat of the waters, was *an hundred and fifty days*;

* Vid. The Sheppey fossils in Leicester House.

and

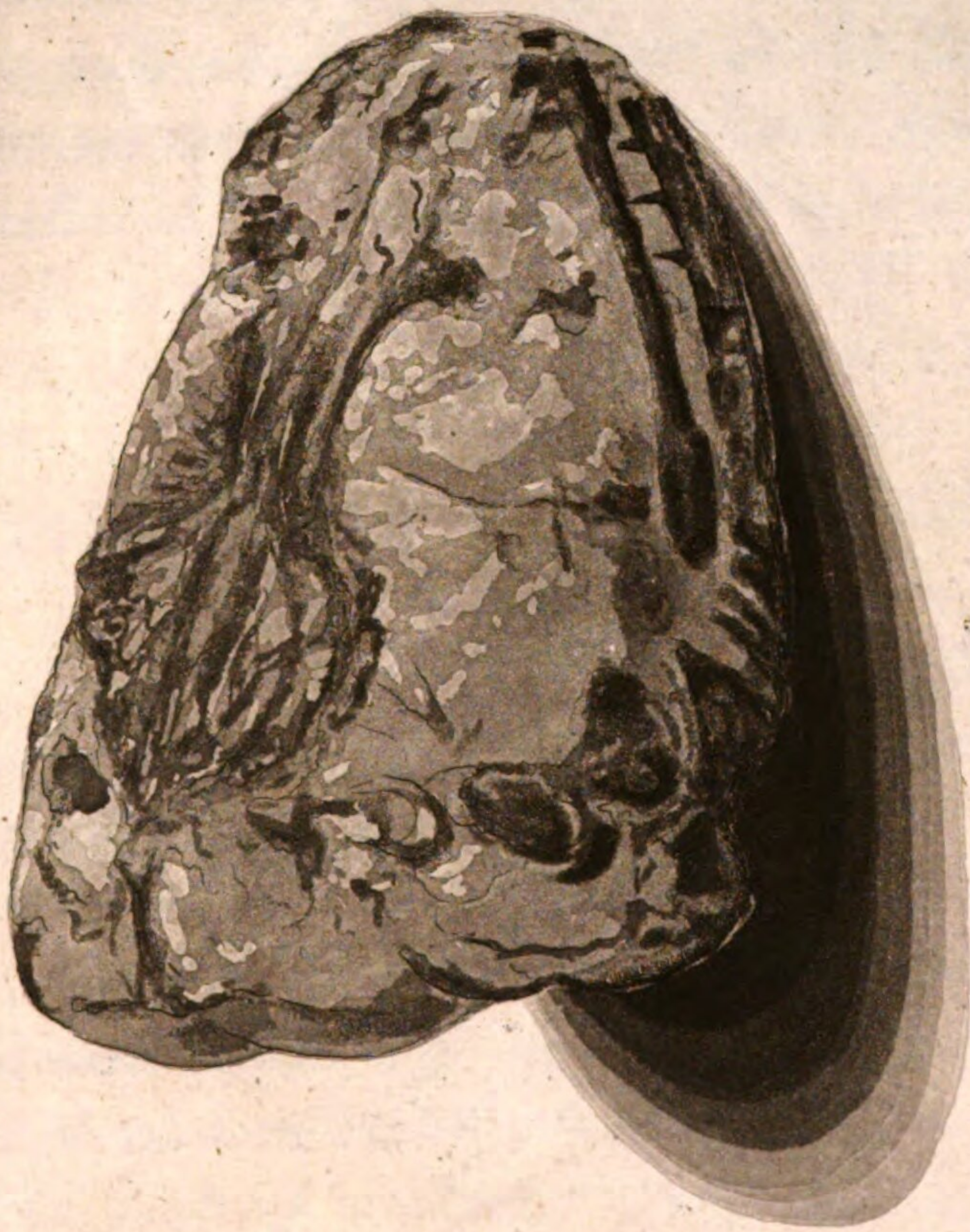


This Fossil is in the possession of Sir Joseph Banks. Bar: Pr. R. S.

Sec: in Aqua Tinta.



This Fossil is in the possession of Sir Joseph Banks. Bar: Pr. R. S.



Ed. fec. in aqua tinta

The Head of a Pike

and as no convulsion in Nature is described by Moses, which might have caused these fluvial remains to have been discharged from their native regions in positions so apparently unnatural, and placed with other bodies, perfectly heterogeneous in their nature, the produce of the land, we are undoubtedly authorized to believe, that with the reflux of the waters, so most of its inhabitants had also retreated. The VII. and VIII. CHAP. of Genesis, which treat of the deluge, only speak of the living creatures of the earth ; but no mention is made whatever of the inhabitants of the deep.

CHAP. VII. VERSE 22. *All in whose nostrils was the breath of life, of all that was in the dry land died.*

VERSE 23. *And every living substance was destroyed which was upon the face of the ground, both man and cattle, and the creeping things, and the fowls of the heaven ; and they were destroyed from the earth : and Noah only remained alive, and they that were with him in the ark.*

THUS

THUS we are permitted to infer from these sacred assertions, that other causes must have transpired to have operated effects of a nature so essentially dissimilar. The bed in which these remains are found, shew them to be of an antideluvian period * ; a period beyond the records of man, and attended with such circumstances, that we might not unreasonably conceive some calamitous event had possibly destroyed all animal life † from the face of the earth, and consigned to oblivion a cause, the record of which must otherwise have been transmitted from posterity to posterity, to the very end of time.

THOUGH the Scripture says, *All the fountains of the great deep were broken up*, an expression which

* Vid. the Appendix to this Dissertation.

† WHEN men of inquiry consider this remark with every necessary retrospect, and who have had opportunities of turning their thoughts to the practical study of these fossil phenomena, I do not hesitate to say, that they will have a constant supply of examples to incline them to adopt a firm belief, that this earth has undergone a commotion, abstracted from the deluge alone, which might have destroyed its inhabitants, if not totally, perhaps partially so, on the spot where such a commotion took place.

would imply a convulsion of some extraordinary nature ; yet we have, I again repeat it, no authority to conclude, that this convulsion was in its effects equal to those which have produced the fossil phænomena that are found in the bowels of the earth, in all quarters of the globe. This doubtless would have procured effects similar to those which are found under circumstances descriptive of similar commotions, such as the strata of fossil bones found on the coasts of Istria, Dalmatia, in the islands of Cherso and Osero*, in the island of Cyprus, in most of the PLATE VI islands of the Ægean sea, and the rock of Gibraltar†, which imply the most convincing proof of an alluvion

* Vid. PLATE VI. which I have here prefixed to give an idea of the situation of these islands, to be referred to in this argument, and which perfectly agrees with the description of the Abbé Fortis, p. 361, to p. 429.

† As these bones have improperly been ascribed to the effects of the Samothracian deluge recorded by Diodorus Siculus, I have thought proper to transcribe the passage from the above author, and to offer my remarks upon it, for the consideration of those who have made this interesting part of fossilogy their study

Οἱ δὲ Σαμοθράκες ἰσχυροῦσι πρὸ τῶν παρὰ τοῖς ἄλλοις γενομένων καὶ ἀκλυσμῶν ἕτερον ἐκεῖ ὡς γὰρ γενέσθαι, τὸ μὲν πρῶτον, τοῦ περὶ τὰς Κυανέας σομάδος ραγέντος,

vion by the dislocation and fractures of the bones,
and here and there small specimens of shell fish im-
bossed

μετὰ δὲ ταῦτα, τῷ Ἑλλησπόντῃ. τὸ γὰρ ἐν τῷ Ποντῷ πελαγῶς λιμνῆς ἔχον τὰξιν, μέγρι τοσούτου πεπληρῶσθαι διὰ τῶν εἰσρέοντων ποταμῶν, μέχρις ὅτου διὰ τὸ πλῆθος παρέκχυθὲν τὸ ῥεῦμα λάβρως ἐξέπεσεν εἰς τὸν Ἑλλησπόντον, καὶ πολλὴν μὲν τῆς Ἀσίας τῆς παρὰ ταλάτταν ἐπέκλυσεν, οὐκ ὀλίγην δὲ καὶ τῆς ἐπιπέδου γῆς ἐν τῇ Σαμοθρακῇ θαλάσσαν ἐποίησε. Καὶ διὰ τοῦτο ἐν τοῖς μέγα γενεαῖς καιροῖς ἐνίοις τῶν ἀλίων ἀνεσπακεναὶ τοῖς δικτύοις λίθινα κιονοκρανα, ὥς καὶ πόλεων καίλακεκλυμένων. Τοὺς δὲ περιλειφθέντας προσαναδραμεῖν εἰς τοὺς ὑψηλοτέρους τῆς νήσου τοπούς. τῆς δὲ θαλάσσης ἀναβαινούσης αἰὲ μᾶλλον εὐξασθαι τοῖς Θεοῖς τοὺς ἐγχωρίους, καὶ διασωθέντας κυκλῶ περὶ ὅλην τὴν νῆσον ἔρους θείσθαι τῆς σωτηρίας καὶ βωμοὺς ἱδρυσασθαι, ἐφ' ὧν μέχρι τοῦ νῦν θύουσιν. Diod. Vol. I. Sec. 253, lib. v. p. 369. *Pet. Wessel.*

“ THE Samothracian historians assert, that before the floods
“ recorded of other nations, a very great one happened in their
“ country ; this deluge was produced by the eruption of the wa-
“ ters, which at first broke through the Cyanean rocks, and after-
“ wards rushed into the Hellespont. The Euxine sea, formerly a
“ great lake, was then so much swelled by the waters which
“ entered it, that not being capacious enough to contain them,
“ they overflowed into the Hellespont, where they submerged
“ a great part of the maritime Asia, and also overwhelmed great
“ districts of Samothracea. In confirmation of this, fishermen
“ in latter times have dragged up stone capitals of pillars in their
“ nets, which prove that the sea covered the ruins of their an-
“ cient towns. It is reported that the inhabitants who escaped
“ fled to the more elevated lands, but the sea still increasing,
“ they



bossed in the mafs ; whereas all the large spoils of marine animals are never found with them : an attested

“ they invoked the Gods, and thereby being delivered from their
 “ perilous situation, they encompassed the places where they
 “ were preserved throughout the whole island, and there raised
 “ altars, where they perform sacrifices to this day to their Gods.”

THOUGH the Illyric fossil bones have been originally deposited by a flood, on their respective coasts, it is also evident the original stratum in which they were inclosed, has undergone a considerable change ; observable by their confinement in a lapideous ochreo-stalactic earth, alternately composed of marble splinters and bones; these splinters of marble are of an angular shape, and consequently have never undergone any trituration by the waters. According to the very critical and modest account of the Abbé Fortis, these strata are found interrupted in large insulated masses dispersed among the mountains, of a very different substance from those that surround them, which prove the existence of strata, that have been fractured by some convulsion in a remote period of time. The deposit of these bones under the basis, or in the hearts of hills, vid. PLATE VI. those in particular which pervade the rock of Gibraltar at the height of one and twenty feet only from the level of the sea, measured by Lieut. Col. Davies, of the Artillery, anno 1784, at the ebb of the tide, which in the Mediterranean does not exceed four feet; their compacted nature, and in particular their physical constituent quality, which show them to have been so indurated by a power different from the ordinary accretion produced by sparry or stalactical induration, evince that the alluvion, which had originally floated that immense, that wonderful congeries of animal bones,

tested evidence, that with the retreat of the waters, so the fishes receded into the bosom of lakes, rivers, or oceans.

WATER

bones, was much anterior to the Samothracian deluge mentioned by Diodorus, or that of the Egyptian priests, which learned men have had occasion to mention on the subject of these bones.

THE Samothracians, in the time of Augustus, may have shewn the altars that were erected over their island, where the waters had reached, and where their ancestors had retreated; and though they are doubtless monuments that an irruption of the waters had actually happened in those parts, yet they are also memorials, that the fossil bones, from the above argument, were not the wreck of that deluge.

PLINY says, Lib. ii. Cap. lxxxvii. “Claræ jampridem insulæ, Delos et Rhodos, memoriæ produntur enatæ. Postea minores, ultra Melon Anaphe, inter Lemnum et Hellespontum, Nea: inter Lebedum et Teon, Alone: inter Cycladas Olympiadis cxxxv anno quarto, Thera et Therasia. Inter easdem post annos cxxx. Hieræ ædemque Automate. Et ab duobus stadiis post annos cx. in nostro ævo, M. Junio Syllano, L. Balbo cofs. ad viii. Idus Julias Thia.” As the formation of these islands are here correctly accounted for by the expression of the word *enatæ*, we are not at liberty to suppose they were caused by any irruption of the waters which might have submerged the lower countries; and particularly, the origin of the island of Thia seems here so well attested, that we have no reason to doubt the reality of Pliny’s account; consequently if in Delos and Rhodes these fossil bones are found, and in the other islands described by Pliny, we are au-

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thorised

WATER and fire uniting, would certainly produce the most extraordinary disorder on the face of the earth ; and by disjoining lands over which rivers had flowed, and subtending by the rarefaction

thorised to suppose that they must have pre-existed the period of the Samothracian deluge : let us also state that they have been found in the island of Cyprus, and then this old historian will again be useful to our argument. *Avellit Siciliam Italiæ, Cyprium Syriæ—Lib. ii. cap. lxxxviii.* These islands were disjoined by floods from the main land, by an ancient flood which he ascribes to nature, the same being older than the records of his time : therefore these bones being imbedded in the heart of these islands, which otherwise if deposited by the Samothracian deluge, would be found only on the neighbouring parts of the shore, we must still repeat that they were not the effects of that deluge.

THE best informed of our natural philosophers agree, that most of our petrefactions are performed under the sea ; and as the Abbè Fortis, vid. p. 448 of his work, gives good authority for supposing, that these strata of fossil bones extend from the northern shore of the Quarnaro to the islands of the *Ægean* sea, in which these islands recorded by Pliny are situated ; that they have also from good report, been found in the island of Cyprus ; and doubtless the same strata of bones in the rock of Gibraltar : so we may, admitting the most scrupulous caution, infer that they have been indurated in their ochreous and stallaetacious bed by a submarine power, caused by the united action of water and a subterraneous fire, prior to the subtenfion of these islands, produced by the expanding nature of two such powerful agents ; which operation will naturally corroborate the testimony of Pliny, vid.

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lib.

faction of steam, the cause of earthquakes, great tracts of earth, over which, by a succession of similar

lib. ii. chap. lxxxviii. Ante nos et juxta Italiam inter Æolias insulas, item juxta Cretam emerfit è mari, M. D. passuum, una cum calidis fontibus—

WHEN natural philosophers consider with an attentive eye these apparent phænomena, they will have no cause to doubt the various transmutations of land, by the eruptions and recedence of waters, perhaps alone produced by the aforesaid powerful effects of subterraneous fire; and, as in the instance of these Illyric bones, that doubtless were once deposited by some very remote alluvion, and in subsequent ages consolidated by a natural chemical operation of mineral acids united with fire and water, so we should have the clearest evidence to pronounce, that they had been subterred from their natural beds, and displayed to us under the local forms which the above careful traveller, the Abbé Fortis, has so critically transmitted to the world.

THAT floods, subsequent to the universal deluge, have prevailed more frequently in remote antiquity, than in latter times; and as some have transpired under the observation of historians that have recorded them, we can have no doubt from the good testimony of Pliny, who also from apparent well attested tradition, and the accounts of his contemporaries, assigns a strong reason for the cause of the convulsions which have disordered or changed the face of the globe, vid. lib. ii. from cap. lxxxiii. to xcv, which treat of earthquakes, fiery eruptions, depressions and subversions of countries, the dislocations of mountains, and various floods; and what can be stronger than the expression

lar events, the waters may have flowed, and again receded by the like causes ; so various heterogeneous bodies of animals, fish, and vegetables, may have been

expression of the Scriptures, *All the fountains of the great deep were broken up*, to prove that subterraneous fire must have been the cause of such powerful and general commotions ?

STRABO confirms the account of Diodorus Siculus, of the Samothracian flood, lib. i. p. 85, in so clear a manner, that no doubt can arise against the fact. *Philo de mundo non Corrupt.* p. 959. asserts, tho' against the clear evidence of Pliny, that the islands of Delos and Rhodes were produced by this deluge, and indeed should it even seem that all the islands of the Ægean sea had been produced by this cause, we shall still acquire such a demonstration of evidence from the strata of bones which penetrate these islands at such altitudes, and with such masses of earth over them, as could never proceed from their having been deposited at that period, and from that deluge, vid. PLATE VI. which will show the vast PLATE VI. bulk of matter which may possibly cover the bones in various places in the islands. I am therefore inclined from this coincidence of facts, to ascribe most of our fossil phænomena to both these causes united, and not from water only ; and which may properly be called the ΨΡΚΗ ΤΟΤ ΚΟΣΜΟΥ or Plato's Soul of the World.

WE find in Herod. lib. iv. that Vesta was adored by the Scythians, the most ancient of the human race, as the symbol of fire, which they conceived had once embraced the whole universe, and by other ancient nations under various forms. *Ignis qui et mundum*

been profoundly imbedded in the earth; but in this case, the produce of respective climes must be found approximate to the spot where the convulsion happened: thus, from a conclusion of this obvious nature, the *fossil nut* could not have been deposited in the stratum from whence it was taken, by the effects of an alluvion only, but by other causes as distinct as apparently dissimilar in their effects.

ARGUMENTS are frequently produced to assign a cause for the discoveries of fossils, which have no analogy

mundum genuit cuncta possedit. Just. lib. i. cap. 1.; and on the other hand they supposed that a flood or floods had universally prevailed. *Idem sive illuvies aquarum principio rerum terras obrutas tenuit.* The history of the Egyptian Canopus is also an attestation that fire and water were the two powerful agents which had caused a wonderful disorder in the universe; and this was the source of a great dispute between the Egyptian and Chaldean priests in a contest for a superior power to be given to one or the other of these in their mythology. Was this subject to be enlarged upon, it is easy to observe how strong arguments might be produced, that fire has been the original cause of remote inundations, and that the convulsions of the earth, together with the consistency of its component matter; the production of its metals, minerals, and most of its fossil productions; must have originated from the united action of these causes. These few proofs may perhaps be sufficient to confirm what many

analogy with any recent species of this island. It has been observed that many North American fruits have been found on the western coasts of Ireland, evidently floated there by the winds and tides ; this fact I know is well established. Hence it has been inferred that many exotic remains may be found fossil in this island; an argument so purile that I am sure it will not be expect-

many enlightened minds have long conjectured, but have been obliged to forego for the want of such proofs. If they can tend in the smallest degree, by making men wiser, to make them happier, it is surely a glorious reward for the little trouble which has been taken to promulgate these thoughts to the public ; such a thought is of itself an apology for any author to intrude his work ; and in spite of that vanity which the cold misanthrope may fancy to be attached to all human productions, a vanity which human nature has great cause to rejoice in, we should be proud to say, that as happiness is the meditation of our worldly pursuits, so no man can be truly happy unless he is in some respects wise ; that is, unless he is sufficiently instructed in human knowledge to know when to place a barrier to his inquiries, and consequently a regulation for his conduct. In metaphysical or philosophical studies it is therefore necessary, as in the actions of our lives, to know when to limit our researches ; it will be the only method of showing our feeble depending existence on a supreme power, and of circumscribing the human mind in those inquiries which insensibly lead it to scepticism and impiety. No explanation is I hope wanting for the application of this remark.

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ed that I should offer a reason against it ; however I shall produce one, briefly to alledge, that no comparison of this nature can be opposed to the result of the discovery of the *nut* in the isle of Sheppy ; seeing that it was found in a vast stratum of earth, with the remains of terrestrial and marine animals ; a stratum of earth, which could not have accumulated alone by the residue of the waters in any given time, but must have been so subtended by a convulsion of the globe produced by other causes. The fibrous parts of the nut are converted to a stone, and in its constituent quality, it will be found of a nature that must have proceeded from a cause indistinct from that simply arising from the age of its deposit, or the common-received laws of petrification. On a close survey it will be found to have been indurated by a familiar power which operated on the remains of the Hippopotamus, and which power must be referable to a cause which in its natural process perhaps no longer exists.

AN acid menstruum has been lately discovered, which will dissolve the hardest bodies ; and it is well known that the decomposition of fluor spar,
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united with the vitriolic acid, gently fermented with the assistance of fire, will, in passing through water, crystalize, and probably indurate animal bodies opposed to it. But where is this chymical effect now operating by natural causes in the earth? If existing at this period, it must be in the deep mass of the earth, beneath the ocean, or profoundly situated in the neighbourhood of volcanoes, impervious to any human observation.

IF we therefore confront the deposit of these fossil bodies with those of the Hippopotamus, the remains of which have been found in such local circumstances, so fitly corresponding with the actual existence of the animal in these parts, I presume such facts will tend to establish the certain data for the argument of this paper; *That the regions where these animal remains have been found, were at a certain period of time, under a superior influence of warmth than they are at this æra: to shew reason why these bodies could not have been removed by an alluvion of forty days from their native climes at a distance so remote, and to have been deposited under circumstances so clearly opposite to the effects of*

of such a cause : and that the earth has had a power of transmuting bodies into solid and homogeneous substances, at a period beyond the date of written testimony ; or which power, if now existing is, by some extraordinary convulsion of matter, remotely concealed from human observation, within the bowels of the globe.

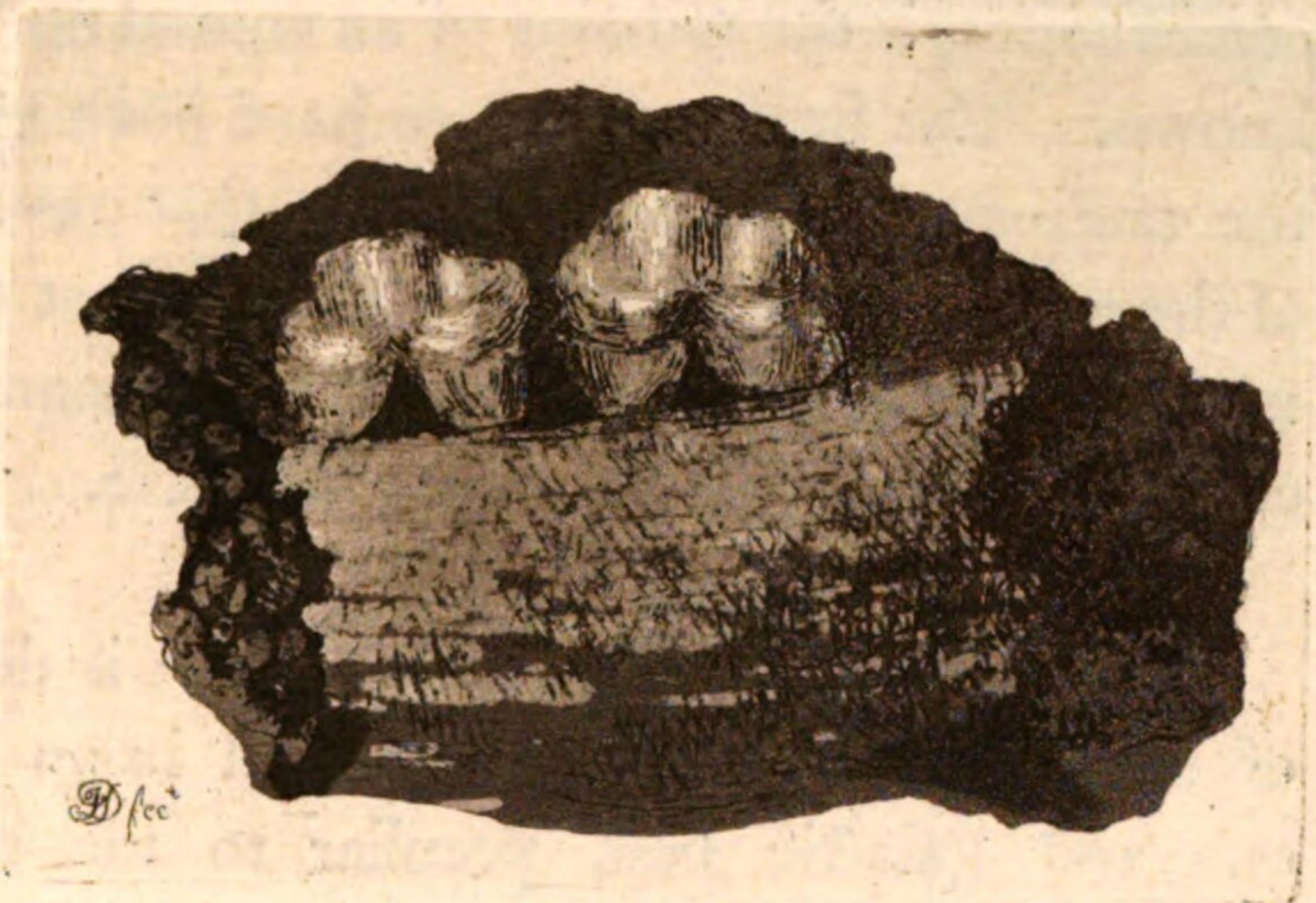
As all men are prone more or less to metaphysical enquiry, it is more dangerous for the cause of religion to have the untutored mind puzzled, than to set it right in matters that will bear explanation ; hence it is well known that men, when they fancy they have discovered any apparent inconsistency in the scriptures, will not rest satisfied with the exact letter before them : wherefore it has been often started as a matter, which requires great reconciliation, that the sun being created on the fourth day, the preceding days could not be computed by solar calculation ; many well-informed persons have therefore been inclined to suppose that the earth was created in six expanses of time, instead of six days ; and with these sentiments they have not been at a loss to account for all

our natural phænomena : these arguments have been likewise stated to prove, that Moses, when he addressed himself to the children of Israel to satisfy the vulgar mind on the nature of the creation, framed his discourse in figures and terms best adapted to their simple and untutored state ; and that admitting familiar incident to physical disquisition, he adopted the solar day instead of an expanse of time, which the vulgar mind could not so readily comprehend ; and thus, instead of explaining a complicated system of physical argument to an unlettered multitude, into whom this great inspired lawgiver was desirous of instilling an awful respect for creation, and above all, religious sentiments for the great obligations due to a supreme invisible power ; he was therefore instructed by the Almighty to make use of a familiar vehicle for the purpose ; a system of nature, which all minds could conceive, and which was equally just with the more profound, though exemplary science. If we therefore respect the history of the world, according to the Mosaical doctrine in its ordinary significance, or by its more complicated import, the religious and well-regulated mind, will have the same cause for venerating the great plastic

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hand of the deity, to whom the creation of matter was in every sense equally efficacious, and to whom time, whether minute, day, or æra, was of no account; the power of the Almighty would be still manifest, and fully as important, as we find it to be recorded in the first book of Genesis.



A P P E N D I X.

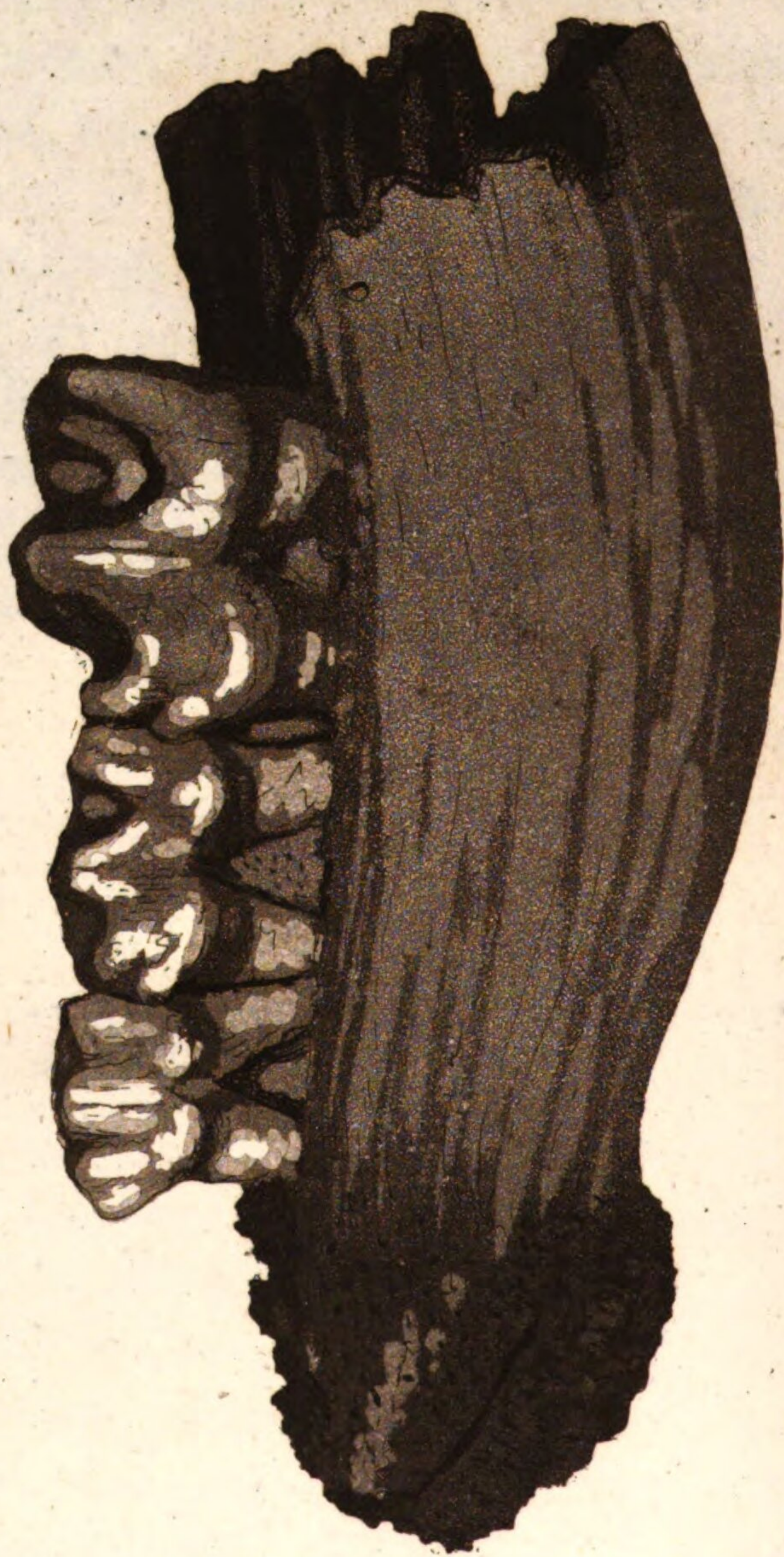
THE above PLATE represents the under jaw of a quadruped, found, with various other fragments of animal bones, in the rock of Gibraltar, brought over by Lieutenant Colonel Davies, of the artillery. This jaw, in the opinion of Mr. John Hunter, whose skill in comparative anatomy is sufficiently established to render his opinion of consequence,

consequence, is the remains of an animal no longer known. The species seems to have been extinct; the cause apparently derived from that revolution of the earth, which universally prevailed at the remote period of time, which I have more fully enlarged upon in the preceding discourse.

LIKE that of the Hippopotamus, it is deprived of its animal matter, and indurated in an ochreous and stalaetic bed, peculiar to the remains of the animal bones found in the islands of the Egean sea: various angular splinters of marble are also found in the same congeries; the bone of the jaw is rendered calcarious throughout, nor do these bones in general seem to be permeated with a lapidescent matter, though in their interstices the ochreous deposit is sometimes very firmly indurated; and in their cavities, particularly of the fistular bones, sparry accretions are formed by the filtration of this matter through the fine texture of bone, when in its calcarious state. The teeth are of as fine a polish as agate; their structure indicate that the animal was of a carnivorous and graminivorous nature; in all graminivorous animals, the enamel pervades the

5 tooth

Page. 45.



Fossil ANIMAL INCOGNITUM bone from THAME.

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tooth in laminae, to hinder the tooth from wearing by the frequent use of mastication of hard substances : this tooth, as is apparent on the surface, has no enamel in the centre, but the hollow is filled up with the ochreous matter. When I first saw this jaw in the possession of Lieutenant Colonel Davies, I conceived it to be similar to one in the Museum of Sir Ashton Lever, No. 20, which was found under ground by digging a well at Thame, in Oxfordshire ; the length is about seven inches ; four inches in breadth to the top of the largest tooth, and three inches to the smallest ; the largest tooth is about one and a fourth of an inch, protruding from the jaw. In both, the symphysis, where the jaw united, and in which the fore-teeth were placed, is very evident ; the only difference in the specimens is in size ; the one found at Thame is larger ; a common difference in the same species of animals ; it is broken off at the third grinder ; the one from Gibraltar is broken off close to the second grinder, as described in the plate.

FROM the appearance of the jaw, found at Thame, I should think it contained the animal phlogiston : the cases being sealed up at Leicester House,

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I had no opportunity to make any trial upon it ; but were this even the case, it does not follow that the bone is less ancient. I have tried fragments of the specimens of the large animal incognitum found on the banks of the Ohio and Mississippi rivers, and have found them to contain almost as much animal matter as a Smithfield bone. The young Doctor Michaelis, physician to the Hessian troops, when he was here, and who took great pains in his inquiries on the spot when in America, concerning this surprising animal, found this to be the case. But fossil bones, it should be observed, do not acquire in all soils equal induration ; nor should it in the least degree militate against my argument, because bones may be found in one soil petrified, in another in a friable state, or lastly, preserved with animal matter in them. Deductions from their component qualities can only be made, when two similar bones are found in similar soils in dissimilar states of preservation.

HENCE from this testimony, subjoined to the others which have been here specified, I should conclude these bones to have belonged to an antediluvian world ; to have been the remains of animals,

mals, pre-existing any floods that tradition has transmitted to us; the remains of animals, that some fatal revolution of the globe had, by the destruction of a vast multitude of the brute, and *perhaps* human species, finally obliterated.

I HAVE observed in the notes to my Dissertation, that the angular fragments of marble found in the strata of bones on the Dalmatian coast, and in the rock of Gibraltar, indicate, that they had undergone no trituration by water, when that convulsion happened which united them in one congeries, but which indicate that the stratum of bones had been formed previously to that commotion, and deposited on that coast by a flood. Since this remark was printed, I have been fortunate enough to bring proof, that these dissimilar commotions of waters seem to have existed *perhaps* all over the earth. This evidence is so curious, yet so true in its nature, that I cannot find a better place to record it in than here.

I HAVE the specimen of a flint, originally formed in a chalk bed, which I found in a stratum of fine sea sand, blended with small triturated fragments.

fragments of chalk, flints, and gravel, on the side of the London road, which descends into the town of Stroud, near Rochester. The flint has a fair impression of a middling size pectinite on its surface; it has been fractured, and its angular parts, have evidently been rounded by the waters; this is particularly observable on the shell, which has its converging indented lines worn down on the part where it has been so chafed. The shell fully demonstrates that the component parts of the flint must have been in a fluid vehicle, to have been received into its mass, and originally in a different bed to its recent one, which the most unskilful eye can perceive is not of made earth. The first layer is of pebble and sand; the small rounded fragments of chalk are in layers interspersed with gravel, fine sand, and flint stone, under which is a natural rock of chalk: each stratum in an horizontal level, so framed by the deposit of the waters.

THE flint, with the impression of the shell, as I before observed, was found in the stratum of rounded chalk, gravel, fine sand, and flint; incontestably asserting, that a remote marine deposit had been originally formed, when the flint was enclosed

closed in its native bed, subsequent to which a revolution of the waters had prevailed on those heights in which the flint was found, now considerably above the level of the river Medway; that this revolution must have been accompanied with a violent commotion, to have dislocated the stratum of chalk in which the flint was originally produced, and to have brought with it the heterogeneous bodies which form the different strata. It should also seem by the rounding of the asperities, of the fractured parts of the flint*, that the waters had prevailed no inconsiderable time on those heights.

It is from the assemblage of these facts, in these studies, that all true knowledge can be acquired,

* The pebbles that are found on the sea coasts, and in many, beds of the earth, do not receive their forms by attrition only, but have been so rounded in their original structure, in the beds of matter from which the waters or other revolutions of the earth have at some distant period separated them. They have mostly like some flints been originally created in nodular forms; attrition by water may perhaps have injured their surface, but they certainly do not owe their recent forms to this latter cause. This inquiry, as may be seen at first sight, would admit of an elaborate treatise to explain it in a satisfactory manner.

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and fixed principles received: when they are advanced with caution, and with a scrupulous care, they are of the greatest importance to the history of those revolutions under which all nature, at different periods of creation has universally been subject to, from the wonderful and united power of *Fire* and *Water*.

REMARKS

R E M A R K S

O N

M. LE COMTE DE BUFFON'S SYSTEM.

HAVING said so much on the subject of the apparent phenomena found in the bowels of the earth, and the argument naturally rising to a more extensive disquisition ; and as the minds of men are consequently still soaring to a more elevated inquiry into the history of the world, I shall therefore briefly animadvert to one or more of our modern writers on the subject, whose names are known,

known, and whose arguments are variously received, according to the knowledge, labour and skill of some patient and rational beings, or the idle and superficial conceptions of others. My only view is, to render the subject no longer a matter of dispute, and by concentrating the truths of other writers to my own observations, to establish a principle as a foundation for more useful inquiries; and to regulate the minds of ingenious men on a subject of this momentous nature, by which their religious, moral, and scientific conduct may be turned to a proper bias; to their own and the public happiness.

M. le Comte de Buffon, in his Supplement to his Natural History, has concentrated a prodigious collection of materials, to establish a very ingenious argument; his inquiries are profound, and his deductions from natural facts seem to be justified by many cotemporary and approved principles; how far his justification may be true or false, I shall not in this place take upon me fully to investigate; as his labours have been great, and his principles in many instances have reflected the greatest honour on the study of Natural History, I shall al-

ways speak of him with respect; and particularly in this last work, I am sure that impartial men, who read him with attention, and have previously studied some heads of the matter which he treats of, will join with me in rendering due homage to his abilities and to the service which he has been of, in repelling the stubborn principles of ignorance and fanaticism.

THIS learned and ingenious writer has established his epochs of nature on the following principle of Sir Isaac Newton: That the equatorial exceeds the polar diameter of the earth in the ratio of 230 to 229; consequently the earth must be in the form of an oblate spheroid; invariably a natural property of all bodies, in a state of liquefaction, having a rotary motion round their axes. He then considers whether the earth was in a state of liquefaction by water or by fire, and produces various reasons to shew that its primordial constituent fluid matter was of a vitrified nature*: that the earth, in

* *Toutes les matières du globe sont de la nature du verre.* Vol. I. page 16, Octavo edition. This general truth, which may be
P demonstrated

in a certain given time had received a sufficient state of temperature to admit the waters upon it, which till that epoch had been suspended over it by the immense power of its incalascency. Hence from the scoria of the globe, fractured and variously dislocated by the contact of two such powerful agents, *Fire* and *Water*, a matter was formed or deposited on its surface, in which the plastic power of the deity operated, and animal and vegetable life in a succession of time were variously modified and produced: by this doctrine he accounts for the deposit of fossil bodies all over the globe, and reconciles all other apparent terrestrial phenomena to this event.

demonstrated experimentally, was conceived by Leibnitz, the great German philosopher. Sanè plerisque creditum et a sacris etiam scriptoribus insinuaturn est, conditos in abdito telluris ignis thesauros; adjuvant vultus, nam omnis ex fusione *Scoriæ vitri* est *Genus*. Talem vero esse globi nostri superficiem (neque enim ultra penetrare nobis datum) reapse experimur, omnes enim terra et lapides igne vitrum reddunt; nobis satis est admoto igne omnia terrestria in vitro finire, &c. G.G. Leibnitz, *protogeia*, p. 4. *Toutes les matières terrestres ont le verre pour base, et peuvent être réduites en verre par le moyen du feu*, Tome I, page 17. M. de Buffon says, there is matter which common furnaces cannot reduce to glass, but with a good lens the same can be operated.

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I SHALL now beg leave to offer my remarks on this curious argument. Since Burnet, Whiston, and Woodward, the most intelligent of our natural philosophers have admitted in part, a subterraneous fire, but I only know of one, Mr. Whitehurst, who has, besides M. le Comte de Buffon, proved the same to have been general; when I speak of fire I do not infer an heat with which the earth has been indued to produce an increment to all its inhabitants; but an universal fire that prevailed at a remote period of time, and which has occasioned the present disorder which is now obvious on the face of it.

IF the globe, in its original state had been in a vitrified state of fusion, the waters 'tis true, when received upon it may have entered the caverns produced by its condensation, and by the reciprocal power of heat and water, the most tremendous convulsions may have originated; but in this case the profound deposit of calcareous matter*, replete with marine *exuviae* could not be accounted for, over which strata of heterogeneous deposits are fre-

* See Mr. Whitehurst in his inquiry.

quently

quently found shattered and displaced at great distances from their original position.

ADMITTING a state of fusion to the globe, and its fitness of temperature to receive animal life ; by a powerful concussion, the waters may have receded from their primitive beds, and have left their produce on their respective lands ; but those deposits would not have been indurated to the surprising power which we now find them, by the laws of affinity, impelled by attractive powers only, but by the power of that subterraneous heat which I have contended for in my foregoing dissertation ; and admitting this, then that power which would be necessary for the induration of these bodies, their cohesion, by affinity and repulsion by dissimilarity, would have been incongenial to the vivication of animal species ; consequently this power must have existed posterior to the deposit of marine and terrestrial productions. I did not mean in this place to mention Mr. Whitehurst's name, as it comes in rather immethodically ; but so natural do his arguments concur with my sentiments, that I am happy to pronounce his testimony as the fittest for my purpose. “ Shell fish, says he, are found

“ at the depth of many hundred yards, embodied in
“ the solid substance of the lime-stone strata, through
“ their whole thickness ; as may be observed in
“ all the cliffs, and in the deepest mines in Der-
“ byshire ;” and above this stratum, in another
place of his work, he observes that *the bassalt*,
toad-stone, or lava, a volcanic erupted matter, is
found in the perpendicular fissures of the mines ;
and this again covered with other heterogeneous
horizontal laminæ ; the undoubted testimony of the
existence of fire subsequent to the calcareous de-
posit in question, and which perfectly corresponds
with my argument. It is alledged by M. le Comte
de Buffon, that volcanos have erupted poste-
rior to the reception of the waters on the globe ;
this is certainly admitted, but it cannot establish a
succession of epochs in the creation of matter ;
that the waters being received on the earth when
congenial for the increment of animal life ; so, by
a succession of convulsive events, the waters have
receded from the continents, and other continents
have in their turn become the beds of the waters :
this argument defeats itself, and in justification of
the Mosaical account of the deluge, which the
Comte has most respectfully shielded from any vul-

gar misrepresentation, we may reconcile that alarming convulsion of matter which changed the whole face of the earth. Here Mr. Whitehurst asserts, his great practical knowledge, above most writers, who may not have had such singular advantage ; great good understanding, and great opportunities for such observations.

M. le Comte de Buffon supposes the lenticular stones called Belemnites, and various other sea productions, particularly the Amonian univalvular shells, to the weight of one hundred pounds, and large animals of several species found in regions no longer congenial to their existence, were produced, at a period, when the earth and waters were in a warmer state of temperature to have admitted of their increase : I do not dissent from his opinion in this, but I argue, that no regular series of events can be transmitted to us, to prove that this transition of animal life, has proceeded from a successional and continual decrease of subterraneous heat ; doubtless such an event has transpired ; an event of the most tremendous nature, and whether couched under the *tropes* of Scripture history, which ignorant declaimers may find cause to cavil at, or

to be collected from the aggregate natural materials discovered in all quarters of the world, we have unequivocal arguments to support an assertion, that this event caused an entire change in the features of the earth, superficially as well as internally, and throughout all animal and vegetable life.

I do not mean to write a critique on M. le Comte de Buffon, nor am I so pedantic and curiously invidious, because the human mind is naturally prone to an inquiry into first causes, to arraign his writings : whether the Comte, by seeing strong corroborating proofs of a subterraneous fire, be induced to adopt a singular theory of comets, or to eject this world, which we inhabit from the body of the sun, and render it habitable, by a periodical succession of events ; or whether he be pleased to assign good reasons for other physical effects, which are daily presenting themselves to inquisitive minds ; we should liberally applaud his laborious researches, and even respect his errors, should we be enabled to detect them.

THE order of events which he establishes from the original liquefaction of the globe by fire, cannot

not therefore correspond with the component structure of the earth at this day ; and I am well persuaded the Comte will think with me, when he is pleased to take my inquiry into consideration on the nature of that petrification* which I have treated of,

* It is again necessary, in this place, to remark, that most of our indurated bodies have been formed at a certain period, when the earth was endued with a power of heat to operate, by the laws of attraction and affinity, upon the component parts of matter.

STONY, mineral and stalactacious concretions may be formed in caverns, where, by affinity, and the different laws of attraction observable in heterogeneous bodies, the air may dispel the fluid vehicle and thus complete the consolidation. Agglutination may also be produced from the spume of shell fish, and sea animalcule, which operating on certain heterogeneous bodies, will unite them into a firm mass. By this process, certain soft land, which is often undermined by the sea, will in the water become rock in a very short period of time ; but when we are informed, “ that a human skeleton has been found in a stone quarry entombed with relics descriptive of its date of inhumation ; “ and also “ bones, armour, a buckle, and a Roman coin in a “ stone pit ;” to establish a proof that such solid substances were in a state of soft texture, when the same were deposited, we must dissent from these recorded opinions, (see Mr. Whitehurst’s Inquiry, p. 15.) Induration of this nature cannot be performed in so small a period of time ; on critical examination these ancient remains would have been found incised in the rock. I have had various opportunities of making this remark, particularly in chalky soil, where
I have

of, being compleated with fire and water united ; and allow a separate period in the antiquity of the globe, distinct from that regular order or series of events, which in his opinion, has caused the distorted appearances which the earth at this æra presents to us ; a period which entirely defaced the structure of the globe, by a convulsive dislocation in all its parts ; transmuting the interior composition of matter ; varying the original property of vivified nature, and altering the temperature of the atmosphere in those regions, where greater proliferation and congeniality to the animal, the marine, perhaps

I have dug up some hundreds of human skeletons of equal antiquity. But when the above ingenious work describes the vertebra of a crocodile, thirty feet long, found in the mountains of Canne, near Maestricht, in a stratum of sand, stone, and other marine and terrestrial bodies in various matter, deeply buried in the earth ; such testimonies can be received, and fair deductions established. My opinion is, that these remains were of the antedeluvian world ; and so indurated, by a power which the earth within human inquiry seems no longer to possess ; see this more particularly treated of in page 38 of this work. Stalactaceous matter, and some minerals may be produced under human observation ; but has the operation of indurated chalk, flint, &c. ever been noticed in its process, or its induration satisfactorily accounted for ?

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the aerial * and vegetable beings, at the early period of creation were established.

M. Le Comte de Buffon observes, that all dales, vallies, mountains, and hills were produced by the united causes of fire and water; granted; but I apprehend not proceeding from a primordial event, which he thus explains: “ When the earth first
 “ received its consistency, there arose on its surface various asperities, bloats, like those produced
 “ on a body of melted glass or other metals; this
 “ first cause has then produced the earliest and
 “ the highest mountains, which have their basis in
 “ contact with the interior solid mass of the earth;
 “ and under which, as in all other parts, there
 “ would be found caverns which in different periods of time would have been compressed; but
 “ without considering this secondary event of the
 “ caverns, it is certain, that in the primordial ages,
 “ when the earth received its consistency, it was

* Mr. John Hunter, has, in his cabinet, the fossil remains of a bird of a most extraordinary size; a bird of that enormous dimension, which apparently would exceed all human belief, especially in these climes, when no similar or even comparative species are now existing.

“ furrowed in all its parts by the action of cool-
“ ing. Afterwards, when the waters were discharged
“ from the atmosphere, which event took place, when
“ the earth had become less intensely hot, to distend
“ the waters into an atmosphere, then they fell
“ upon the earth, to the amount of 2000 toises, or
“ 12,000 feet; and during their long residence on
“ the continents, the fluxes, refluxes, and cur-
“ rents changed the disposition and the form of the
“ primitive mountains and vallies.” I have here,
with much brevity, selected the principal argu-
ment of this writer, and in answer, I shall as briefly
state, that if my argument on the nature of the
induration of matter in which the remains of ani-
mal, marine, or vegetable productions are found,
be fully considered, then this succession could not
be the case. It is a succession of these events
which I contend against, and for a *distinct con-*
vulsive period which the earth has undergone, in-
dependant of that principal irruptive epoch which
he assigns to the earth, produced by its early ages
of incalascency. This succession of waters on
the continents could not alone produce by their
deposits, by attraction and the laws of affinity, the
indurated matter, which is every where to be found
on

on the surface as well as in the bowels of the earth : earthquakes may have partially exploded great districts of continents ; volcanos may, by uniting their power, also have caused the condensation of fluid, and detached bodies ; but the component matter of the remains of sea and land animals, almost universally prevalent ; must have been produced at one decisive period ; at a period when the plastic and sublime hand of a Deity had shapened animal life, and endued the world with a temperature far different to these latter ages of creation. Such a doctrine of the Comte de Buffon, may justly and naturally induce a great mind to arrange a system of creation, but it must nevertheless oblige him to depart from Scripture definition, which though obscure, yet if considered physically and profoundly, will establish that epoch which I am now, though like every humble being, surrounded with the infirmities of human nature, but too much deficient in words and diction, to convey a powerful and energetic significance of. God only can develop the mystery : we may, as society by degrees acquires an aggregate or compound knowledge of nature, approach to the truth of these abstruse inquiries ; but
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we must still be forced to confess our incapacity to comprehend their perfection.

I SHALL now turn my thought, to this great and awful period, by which the earth has been so dislocated and shook to its center.

SINCE the discoveries, that have been made on water, have tended to prove, that this fluid is not an elementary principle, but composed of air and earthly matter, many of our most able philosophers have conceived this earth to have been created, or to have received its recent consistency from water only ; so that the world was originally a globe of water, condensed by attraction and affinity ; and in time modified to its present form ; be it so, and let us also think with M. le Comte de Buffon, that it was in a state of vitrified liquifaction. The Comte in this, has only adopted a secondary cause ; and our water philosophers may conceive their system nearer to the first principle of created matter. They are all still very, very far from the original great cause of all : thus I am sure, my readers will agree with me, that all argument on this head, is only departing from a fit
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and consistent inquiry ; an inquiry which should be confined to that epoch, which has reduced our terraqueous globe to its present consistency ; an inquiry, which, by fixing the principles of the learned may induce them to turn their thoughts to those studies, which may benefit mankind, and render their sojourn in this earth, which they are treating of, conformable to rational precept, to civil and religious utility.

As there is no end to quotations and arguments, I shall only select two passages from the Scriptures, to show that an irruption of the waters had inundated the universe, and which inundation was produced by the elastic power of steam, produced by a subterraneous fire. Moses has transmitted to us these words : “ *The fountains of the great deep* “ *were broken up ;*” and what natural power was equal to this event but the one which I have here submitted to the learned ? The fire had caused a subtenfion of the waters, as also the beds on which they flowed, and in this case, until the convulsion had opened a free passage through the superior regions of the globe, the waters most assuredly would have

have risen to the greatest altitudes, and again have descended, when the extraordinary contusion had subsided, to the basis, where, with some slight succeeding changes we now behold them. Who could not enter into an almost infinite detail, on this subject, and without much complicated argument, render all the natural appearances on the face of the globe subservient to this pre-eminent convulsion? So much has already been said on the subject, that I shall content myself with the business of reconciling these events to sacred authority; and of stating some apparent errors of authors, for the more clear elucidation of such an interesting inquiry.

THE CIV Psalm has a strong relation to the original creation of the earth; and the same may be observed in various passages of holy writ. It is not the inspiration insisted on, of these writings, which should turn the hearts and the minds of men, from contemplating such very ancient and well connected authorities. If men are sceptics in this particular, they should not recede from corroborated testimony? And, to use a comparison

son rather below the majesty of these writings, I will ask whether modern antiquarians will reject all the assertions of history recorded in monkish books, because truths are couched under miracles and necromancy*?

HE LAID THE FOUNDATIONS OF THE EARTH; THAT IT NEVER SHOULD MOVE AT ANY TIME.

HERE is consistency given to the globe; that its interior parts should not, after having received their solid structure, be fractured by any concussion; nor have they been; as the convulsive operations were performed, remote from its center.

THOU COVEREDST IT WITH THE DEEP LIKE AS WITH A GARMENT: THE WATERS STAND IN THE HILLS.

Is not this a confirmation of the consistency and quality of the earth, in its first ages, before the general eruption was produced?

* See Gildas, Bede, Jeffrey of Monmouth, &c.

AT THY REBUKE THEY FLEE: AT
THE VOICE OF THY THUNDER THEY
ARE AFRAID.

Here is all that disorder, that terrible concussion produced, which I am contending for. The waters are violently agitated by the elastic power of fire and water united, within the bowels of the earth. *The voice of thy thunder.* What a sublime simile of subterrene explosion!

THEY GO UP AS HIGH AS THE HILLS,
AND DOWN TO THE VALLIES BE-
NEATH: EVEN INTO THE PLACE WHICH
THOU HAST APPOINTED FOR THEM.

Who, but a great natural philosopher, could have couched the awful period of the general deluge under such a correct and *religious* simile? And does it not critically explain the cause of a general and mighty convulsion? an epoch so tremendous, which could not fail of being known by the enlightened part of the world in these remote ages. What author can presume, in this case, to contend with Scripture authority, and hazard his

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unfounded reasoning to a world, alas ! but too sensible of improper and mistaken impressions*.

When

* See Toulmin on the the Antiquity and Duration of the World, page 160 : “ The inundations of the ocean, that have
“ been esteemed universal, and recorded in the traditions
“ of various annals of mankind, would seem here to solicit
“ some attention. Partial encroachments of the sea, which have
“ ever existed, must alone have given rise to these vague and
“ inconsistent narrations. In an uncultivated age, when men
“ were ignorant of the established laws of nature, every
“ little incident was exaggerated, and might have been sufficient
“ to have given birth to the most absurd and incredible conjecture.”

THESE partial inundations have doubtless transpired, and are evidently recorded. Many of them have, in remote periods of time, produced terrible devastations; but these inundations were by no means partial encroachments of the sea, see Diod. Strabo, Pliny, and various other ancient authors. Fiction also may have adorned the mythology of the ancients, but truth is, by the discerning part of mankind, soon perceived in their writings. But these partial inundations, have no relation to the general and great epoch, which is so fully exemplified by natural memorials in every quarter of the globe; by which all the face of the earth has been changed, as we now behold it; and the testimonies of which the above learned author seems thus to reject: “ *That the insufficiency of the water of the ocean, to cover the*
“ *whole earth*; the unnatural supposition of a great and interesting
“ part of nature, being at once destroyed, the inconsistent
“ manner in which all such stories are ever related, impress us
with

When gentlemen write, they should first be founded in practical knowledge, and not alone in the writings of authors, who, even the best of them, are too replete with error, the natural property of human nature, to be trusted. They should compare their own critical studies to the conformity of such writings, and thus endeavour to approach to truth; and then let me again repeat it, they will

“ with insurmountable incredulity. In short, *they never can be*
 “ *received, never can be thought reconcileable to reason, by the sensible and*
 “ *enlightened part of the human species.*” When gentlemen of talents, thus peremptorily argue, with warmth, against the sacred testimony which I have taken but little pains to justify, they will not surely be surprized to find their observations attacked. Mr. Toulmin has been fascinated with his subject; but reflection will make him a convert to a more competent doctrine: *Drink deep, or taste not.* As the above writer, is not explicit in this passage which I have quoted, or the one which follows it, the ambiguity will admit of my construction; and least a doctrine, which is erroneous in itself, and of much prejudice to society, should be inculcated, I am surely at liberty to infer, from this remark,
 “ That our immediate predecessors were firmly and universally
 “ persuaded of the real existence of *the merest phantoms of imagi-*
 “ *nation;*” that he has the sacred testimonies in view, and as such I have pointed my present argument; which the most unprejudiced reader must allow to have the strictest conformity to the principles of my foregoing dissertation; and which have been framed on the immutable laws of nature, which he also, though I am sorry to say, in a very mistaken manner is contending for.

have

have fresh cause to admire the valuable and true exposition of sacred documents. But to finish this exposition in this last verse, which I have quoted, the waters are said to have descended *to a fixed, a settled abode* : since which, agreeing with profane writers, and with modern essayists, that a Samothracian deluge has prevailed, other deluges also, and that the seas have laved in a partial manner certain continents ; but these events, I must again assert, are perfectly distinct from that universal commotion which gave authority to the Psalmist for his wonderful description of that tremendous event.

I do not hold myself, so literally bound by the strict assertion of Moses as to suppose that all the earth was effectually covered by this great eruption of the waters, though from such a cause as I have here represented, doubtless an universal flood might have prevailed, and have been lifted up over the whole earth. The Almighty may have willed that this great lawgiver, the leader of an ignorant and inquisitive multitude, should frame his discourse to them, in such terms as were best adapted to untutored minds. The end was accomplished ;

ed ; the true and only God was adored ; and a religious veneration for his omnipotency instilled into their minds.

THAT mind must be bounded indeed, which cannot perceive the solemn truths of nature, concealed under the influence of apparent forcery and witchcraft prevalent in former ages, and so natural to be received by all denominations of men, who are sensible of their feeble and dependent existence *. These opinions of our forefathers are no obstacles to the liberal and serious inquirers after truth. We should not therefore discard the whole for a part ; and because it may flatter the whim of

* When Virgil describes the astonishment of the Thracians, Rhodope and Ismarus, at Orpheus, when he was explaining the origin of creation ; it is easy to observe the influence of ancient mythology on sound physical argument.

*Namque canebat uti magnum per inane coacta
Semina, terrarumque, animæque, marisque, fuissent,
Et liquidi simul ignis : ut his exordia primis,
Omnia, et ipse tener mundi concreverit orbis.
Tum durare solum, et discludere Nerea ponto
Cæperit, et rerum paulatim sumere formas.*

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some superficial moderns to militate against the Mosaical records, we should not assert other doctrines, in defiance to reason and sacred testimony. If therefore we be inclined to say that a deluge was universal, this deluge may not have prevailed to that degree of devastation as to have submerged all the nations of the world; our new discovered islands may have been separated from main lands, and the inhabitants preserved upon them at that period. Noah may have been forewarned by a conception of this approaching event; and whether by the direct inspiration of God or his own sagacious presage, of some approaching convulsion on the face of the globe, he may have constructed a secure retreat from the inundation of the waters; his posterity may have recorded an event, which more particularly related to that quarter of the world from whence letters and civil society first originated. Thus much I am induced to depart from the exact letter of sacred writ to recall the erring genius of the age to the true and great tenet of their philosophical researches and their religious obligations.

I SHALL now conclude this stricture with a testimony of a few prophane writers. Diodorus Siculus

culus reports, that it was the opinion of many persons of his time, that the Deucalion flood was general, and that all its inhabitants perished, and were again reproduced ; some indeed, says he, only believed the greatest part were destroyed.* This testimony is sufficient, without recurring to many others which are to be met with among the ancients, that they held a general belief of an universal deluge ; such as Lucian in his book concerning the Goddess of Syria ; Berofus's history of Alexander, whose writings were preserved by Cyril ; with a multitude of ancient authors, who bear record of this event, independent of the account transmitted by Moses.

* See chap. I.

REMARKS

R E M A R K S

O N

MR. WHITEHURST'S INQUIRY ON THE
ORIGINAL STATE AND FORMATION
OF THE EARTH.

TH E argument of this inquiry is founded on the same unerring principle of Sir Isaac Newton, as M. le Comte de Buffon has established for the doctrine which he advances in his Supplement to his Natural History : that the equatorial exceeds the polar diameter of the earth in such proportion as the velocity of its diurnal rotation requires : hence it is obvious that the natural law of any body, governed by such a revolution on its axis, must have acquired its oblate spheroidical form
I when

when in a state of FLUIDITY. Therefore as the earth correctly agrees with the laws of all revolving bodies, we are at liberty to conclude that its diurnal motion has undergone very little variation; and hence we are authorised to establish this *fixed principle* from the unerring laws of nature, that it has performed EQUAL ROTATIONS IN EQUAL TIMES, THROUGHOUT ALL AGES OF THE WORLD.

It will not require much retrospect to observe that he has, with a true philosophic mind, produced a strict mathematical argument to show cause why the climates of the earth could not have been varied by any polar alteration of the globe. On this his principal argument in his inquiry turns; and it is to this, now no longer disputed point, I hope, that a universal eruption of the waters, and universal convulsion of matter, can be established; which cause alone will be sufficiently satisfactory to produce a change of climature to those regions, where the fossil antediluvian remains are found, many of which are

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proved

proved to be in nature and magnitude no longer analogous to any species now recent on the earth *.

I SHALL now beg leave to show the conformity of this inquiry of Mr. Whitehurst with M. le Comte de Buffon, and also where their disagreement lies, by which we shall be enabled to select truth from both writers, and by some other trifling combinations, state a clear principle for our philosophical researches.

M. le Comte de Buffon infers from the compression of the earth at its poles and its elevation at the equator, that it must have been in a state of liquefaction by fire; and to prove his argument he shows, by very strong testimonies, that the native rock of the earth was of a compact and dense †

* See the foregoing Dissertation.

† See experiments of Dr. Maskelyne, in his report to the Royal Society, the Schhallien mountain in Scotland, a compact and solid rock; and by which he proves that the mean density of the earth is double to that of the mountain.

substance

substance of the nature of vitrified matter *; observable in the granite and porphyry rocks, on some of the highest mountains. On this hypothesis

* I HAVE thought proper to subjoin in this place, for the more elaborate perusal of the reader, and for the sake of impartiality, the Comte's experiments on certain bodies which acquire consistency and solidity, by the separate action of fire and water. See his *Epo. de la Natur.* p, 451, 12mo. edit.

J'AI fait broyer des grès de différens degrés de dureté, & je les ai fait tamiser en poudre plus ou moins fine, pour m'en servir à couvrir les cémentations dont je me sers pour convertir le fer en acier; cette poudre de grès répandue sur le ciment, & amoncelée en forme de dôme de trois ou quatre pouces d'épaisseur, sur une caisse de trois pieds de longueur & deux pieds de largeur; ayant subi l'action du feu violent dans mes fourneaux d'aspiration pendant plusieurs jours & nuits de suite sans interruption, n'étoit plus de la poussière de grès, mais une masse solide, que l'on étoit obligé de casser pour découvrir la caisse qui contenoit le fer converti en acier boursoufflé; en sorte que l'action du feu sur cette poudre de grès, en a fait des masses aussi solides que les grès de médiocre qualité qui ne sonne point sous le marteau. Cela m'a démontré que le feu peut, tout aussi-bien que l'eau, avoir aglutiné les sables vitrescibles, & avoir par conséquent formé les grandes masses de grès qui composent le noyau de quelques-unes de nos montagnes.

“ JE suis donc très persuadé que toute la matière vitrescible dont est composée la roche intérieure du globe, & les noyaux de

thesis he accounts for the variation of climate and the fossil remains of animal, marine, and vegetable substances found in these quarters of the globe,

ses grandes éminences extérieurs, ont été produits par l'action du feu primitif, & que les eaux n'ont formé que les couches inférieures & accessoires qui enveloppent ces noyaux & qui sont toutes posées par couches parallèles, horizontales ou également inclinés, & dans lesquelles on trouve des débris de coquilles & d'autres productions de la mer.

“ Ce n'est pas que je prétende exclure l'intermède de l'eau pour la formation des grès & de plusieurs autres matières vitrescibles ; je suis au contraire porté à croire que le sable vitrescible peut acquérir de la consistance, & se réunir en masses plus ou moins dures par le moyen de l'eau, peut-être encore plus aisément que par l'action du feu ; & c'est seulement pour prévenir les objections qu'on ne manqueroit pas de faire, si l'on imaginoit que j'attribue uniquement à l'intermède de l'eau, la solidité & la consistance du grès & des autres matières composées de sable vitrescible. Je dois même observer que les grès qui se trouvent à la superficie ou à peu de profondeur dans la terre, ont tous été formés par l'intermède de l'eau ; car l'on remarque des ondulations & des tournoiemens à la surface supérieure des masses de ces grès, & l'on y voit quelquefois des impressions de plantes & de coquilles. Mais on peut distinguer les grès formés par le sédiment des eaux, de ceux qui ont été produits par le feu, ceux ci sont d'un plus gros grain, & s'égrainent plus facilement que les grès dont l'agrégation des parties est dû à l'intermède de l'eau. Ils sont plus serrés, plus compactes, les grains qui les composent ont des angles plus vifs, &
en

globe, which are now no longer adapted by their temperature to their existence ; various other changes he explains on this principle, which cannot

en général ils sont plus solides & plus durs que les grès coagulés par le feu.

“ LES maitères ferrugineuses prennent un très-grand degré de dureté par le feu, puisque rien n'est si dur que la fonte de fer, mais elles peuvent aussi acquérir une dureté considérable par l'intermède de l'eau ; je m'en suis assuré en mettant une bonne quantité de limaille de fer dans des vases exposés à la pluie ; cette limaille a formé des masses si dures qu'on ne pouvoit les casser qu'au marteau.

“ LA roche vitreuse qui compose la masse de l'intérieur du globe est plus dure que le verre ordinaire, mais elle ne l'est pas plus que certaines laves de volcans, & beaucoup moins que la fonte de fer, qui n'est cependant que du verre mêlé de parties ferrugineuses. Cette grande dureté de la roche du globe indique assez que ce sont les parties les plus fixes de toute la matière qui se sont réunies, & que, dès le temps de leur consolidation, elles ont pris la consistance & la dureté qu'elles ont encore aujourd'hui. L'on ne peut donc pas argumenter contre mon hypothèse de la vitrification générale, en disant que les matières réduites en verre par le feu de nos fourneaux, sont moins dures que la roche du globe, puisque la fonte de fer, quelques laves ou basaltes, & même certaines porcelaines sont plus dures que cette roche, & néanmoins ne doivent, comme elle, leur dureté qu'à l'action du feu. D'ailleurs les élémens du fer & des autres minéraux qui donnent de la dureté aux matiè-

not possibly be brought into the compass of this work.

MR. Whitehurst having stated the same principles as M. le Comte de Buffon, on the oblate spheroidical form of the earth, considers whether its fluidity was owing to any dissolvent principle, or to the first assemblage of its component parts. He says it will be readily granted that the earth was brought into existence, either in a solid or in a fluid state; and naturally argues, that if created in a solid state it must have been dissolved by some *universal dissolvent principle*: “ But as no such

res liquéfiées par le feu ou atténuées par l'eau, existoient ainsi que les terres fixes dès le temps de la consolidation du globe; & j'ai déjà dit qu'on ne devoit pas regarder la roche de son intérieur comme du verre pur, semblable à celui que nous faisons avec du sable & du salin; mais comme un produit vitreux mêlé des matières les plus fixes & les plus capables de soutenir la grande & longue action du feu primitif, dont nous ne pouvons comparer les grands effets que de loin, avec le petit effet de nos feux de fourneaux; & néanmoins cette comparaison, quoique désavantageuse, nous laisse apercevoir clairement ce qu'il peut y avoir de commun dans les effets du feu primitif & dans les produits de nos feux, & nous démontre en même temps que le degré de dureté dépend moins de celui du feu que de la combinaison des matières soumises à son action.

“ principle is yet known to exist in nature, he concludes that its fluidity was owing to *the first* *assemblage* of its component parts, and not to any subsequent solution. Hence it appears that the earth had a beginning, and cannot have existed from eternity, as some persons have imagined*.”

THIS opinion of Mr. Whitehurst has been patiently formed from long laborious and practical searches into the bowels of the earth; and it does the greatest honour to human judgement, when we thus behold an inquisitive mind exploring those regions remotely concealed from the generality of men; contemplating the fossil productions entombed in various solid substances; analysing the component matter of the earth; and from an aggregate of these studies, justifying the laws of nature and of God, by shielding the oldest record of human learning from the misrepresentation of quacks, and the fallies of false reasoners, which are now too prevalent in the fashionable world;

* This is a sufficient answer to D. Toulmin on the Antiquities and Duration of the World, 1789; published since Mr. Whitehurst's Enquiry.

but

but his practical observations are strictly conformable to the writings of almost all our prophane writers of any consequence, a circumstance which cannot fail of affording the highest satisfaction to the learned *. He has happily concluded his second chapter, after having stated the opinions of the Egyptians, and with an observation, which is very probable, that the ancient nations, in their doctrine of creation must have adopted their principles either from revelation or reason; and if the latter, they must have

* Zeno affirms that the Chaos in Hesiod is water of which all things were made; the water subsiding made *mud*, and the mud congealing made solid earth. Zeno was a Phœnician, and according to Eusebius, in the book of his Preparation, he describes the Theology of the Phœnicians to be thus: matter had a beginning; and the spirit described by Moses as breath, which is called by the Hebrews, מְרַחֵפֶת Merachepheth, signifying love, produced the *μῶτ* of the Greeks, which some call *mud* from whence all things proceeded; *μῦθος* which in Hebrew, signifies *Tehom*; in Greek *ἄβυσσος* an abyss already in motion. This expression in the poet Ennius, has the same implication. *From muddy Tartarus a birth gigantic sprung.* Appo. Rhod. ivth of the Argonauticks, says *earth was produced from mud*; much more might be selected to shew this prevailing opinion of the Antients, but as I am not writing a regular dissertation on the subject, I content myself only with some cursory quotations more of which may be seen very learnedly treated in le Clerc's notes to Grotius *de verit. Christ. Relig.*

been

been acquainted with the principles of the Newtonian philosophy ; as the chaotic state of the earth could not be deduced from any other doctrines yet discovered.

FROM the hypothesis of M. le Comte de Buffon, I have remarked that no general or universal flood could have been produced, seeing that a subterraneous fire must have subsided in part so as to have admitted of the general deposit of the land and water productions ; and in this case the general elevation of the waters over the earth, could not have prevailed without this agent : in my opinion it therefore seems evident that by some cause a subterraneous fire *, must have been produced to operate a general flood, subsequent to the first cohesion of matter, either from its state of fluidity by fire or by water.

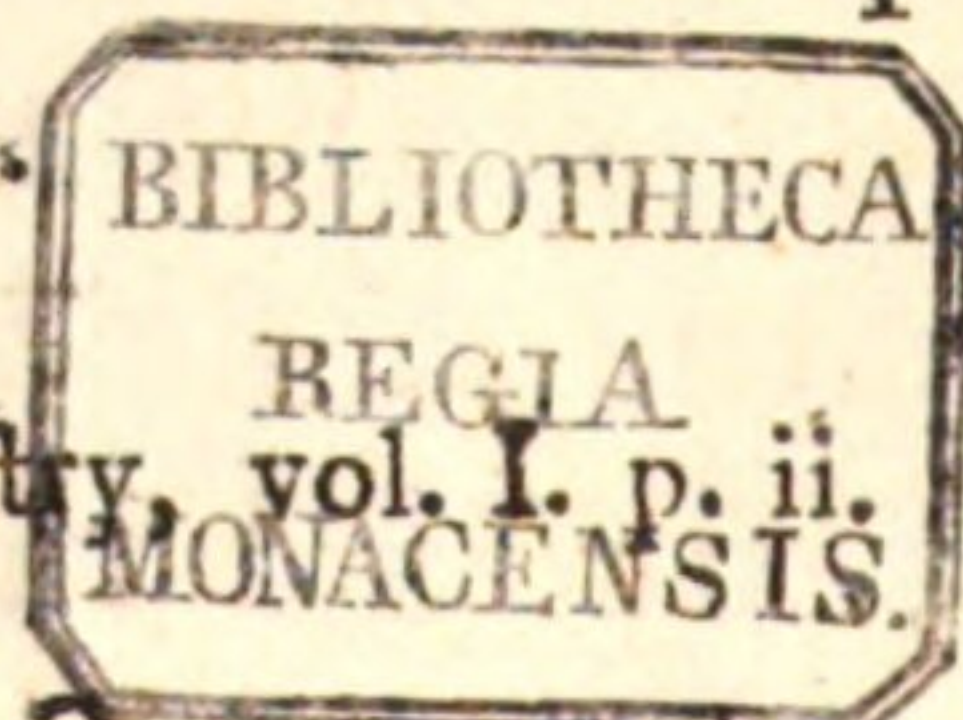
C O N C L U S I O N.

THE earth therefore may have been originally in a state of fluidity by water, which, by the revolution round its axis occasioned its component

* See the foregoing dissertation.

parts to be consolidated by the means of its affinities * ; and by the increment of heat from a degree of moisture and dryness it may have produced a subterraneous fire ; hence all its various revolutions may have originated : it may thus have been in a state of fusion, and have reduced its matter to a vitrified state ; it might have been in contact with a comet, as some philosophers have supposed ; the incalascency may have suspended its waters over it ; the earth may have cooled ; the waters may have fallen upon it again ; and so we may continue to reason without end ; but it is finally obvious in this particular, that M. le Comte de Buffon, and Mr. Whitehurst may be made to agree in their hypothesis, that Fire and Water have been the cause of all the convulsions which have disordered the face of the globe ; and to which I think myself happy, in having added some further testimony ; in hopes that my labours may ultimately tend to restore the minds of a certain description of men, to a sense of physical truths and religious precepts.

§ See M. Macquers El. of Chemistry,



F I N I S.

ERRATA.

P. 4. line 2 of the note, for *vegitable* read *vegetable*.

P. 7. l. 5. for *one* read *two*.

Ditto, l. 7. for *grameniverous* read *graminivorous*.

Ditto, l. 8. for *carniverous* read *carnivorous*.

P. 8. l. 15. for *boney* read *bony*

P. 33. l. 21. for *stallaclacious* read *stalactical*.

P. 35. l. 20 in the note, for $\Psi\tau\kappa\eta$ read $\Psi\tau\chi\eta$.

P. 66. l. 7. for *in* read *on*.

P. 23. for *perforated with a brass ring, which the Pagan, &c. read when perforated with a brass ring, the Pagan, &c.*

P. 26. l. 16. for *the latter totally deprived of any teeth, read the latter deprived of any on its side.*

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12/12



Douglas, James

A dissertation on the antiquity of the earth read at the Royal Society, 12
th May, 1785

London 1785

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